FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 898. (No. 10, Vol. XVIII.) MARCH 11, 1926 [Weekly, Price 6d. Post free, 7d.

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The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2.
Telegrams: Truditur, Westcent, London. Telephone: Gerrard 1828.

Annual Subscription Rates, Post Free.

United Kingdom .. 30*s.* 4*d.* Abroad .. .. 33*s.* 0*d.**

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates.

* *Foreign subscriptions must be remitted in British currency.*

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Mar. 22	....	Entries close for Gordon Bennett Race.
Mar. 31	....	Entries close for Schneider Cup Race.
Mar. 31	....	Royal Aero Club Annual General Meeting.
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EDITORIAL COMMENT.

OF quite extraordinary interest was the paper under the title "The Development of Civil Marine Aircraft," read by Mr. O. E. Simmonds, M.A., A.F.R.Ae.S., before the Institution of Aeronautical Engineers on March 9. Not only was the paper a very long one, which dealt fairly fully with a most fascinating subject, but Mr. Simmonds had managed to collect together a very considerable amount of useful data not, as far as we are aware, hitherto published, certainly not in the form given by the lecturer. One result of his examination of the subject was that according to the information collected—and the lecturer stated that he saw no reason to doubt its accuracy—the seaplane type of aircraft is by no means the inferior sort of vehicle that a lot of people had imagined, from the point of view of the paying load carried per horse-power. On this particular point the lecturer said he had been appalled to read in a paper by Sir Sefton Brancker before the Royal Aeronautical Society the statement that whilst the D.H. 34 carried 3·1 lb. of paying load per horse-power, and the Handley-Page W.8 3·85 lb., the Supermarine *Sea Eagle* could only muster 2·19 lbs. Taking the two single-engined machines for comparison, these figures indicated that the landplane type was 41 per cent. more efficient than the seaplane. Mr. Simmonds proceeded to examine the basis for these figures, and by making allowances for differences in power, engine weight, etc., as well as for the fact that the *Sea Eagle* was designed as an amphibian flying-boat, the lecturer arrived at the general conclusion that one was justified in assuming that, given the same power units, the efficiency, expressed in paying load per horse-power, was approximately the same for passenger landplanes as for flying-boats.

Marine Aircraft

In view of the fact that the D.H.34 was for several years regarded as probably the best commercial aeroplane in the world, Mr. Simmonds's conclusions are highly interesting, especially since it must be borne in mind that, as everyone will, we think, agree, the seaplane has had nothing like the development from which the landplane has benefited. We on

FLIGHT have for many years been staunch adherents to the potentialities of the seaplane. Indeed we might go further and say that the seaplane is the only logical type for an island like Great Britain, and for an empire like the British. Mr. Simmonds's estimate, therefore, comes as a very welcome intimation that the belief hitherto held in most quarters, *i.e.*, that the paying load of the seaplane must *necessarily* be lower than that of the landplane, is at any rate open to doubt, and that until the subject has been thoroughly examined one should not be over hasty in jumping to conclusions.

As regards the reliability and seaworthiness of flying-boats, Mr. Simmonds quoted the following passage from an official report issued by the Air Ministry after the completion of a recent flight around the British Isles of four Supermarine "Southamptons": "Both cruises have shown that under conditions of weather which must throughout be considered distinctly bad, the "Southampton" flying-boats are capable of keeping the air and carrying out such observations as visibility will permit. What is more important, it demonstrates that a programme once having been drawn up, it can be adhered to practically independent of the weather. Refuelling at sea was carried out on all occasions without a hitch, and, provided a certain amount of shelter is available when the flying-boats are not flying, it has been demonstrated that they can function successfully, quite separately and independently of their land bases." "In these words," Mr. Simmonds said, "the Air Council has set its 'hall mark' on the seaworthiness of the flying boat."

* * *

The Southampton-Guernsey Air Route

Another subject briefly referred to by Mr. Simmonds, and again during the discussion, was the unsuitability of the Southampton-Guernsey air route at present being operated in what appears to be a very half-hearted manner by Imperial Airways. It would seem that there is a service every Wednesday between these two points, and even this fact seems to be kept very secret, since we doubt whether, outside Southampton, fifty people are aware of the existence of this service. Quite apart from this fact, however, it is obvious that, although the Southampton-Guernsey route may have been and doubtless was in the earlier days, a very useful one for collecting information, it is not likely ever to attract much traffic, and it is high time that Imperial Airways bestirred themselves and took a somewhat more intelligent interest in the seaplane. Under the agreement with the Government the maintenance of a *regular* service with seaplanes is obligatory, but apparently nothing has been said about the frequency of this service. It thus looks very much as if the service were being maintained at the lowest possible intensity, merely to comply with the stipulations in the agreement. While that attitude persists we are not likely to make progress with seaplanes for commercial aviation, and the Air Ministry representatives on the board of Imperial Airways should make a point of using their influence towards a more practical use of the seaplane. Surely there is no difficulty about running services from some point fairly close to London, such as Tilbury, or even Harwich (both served by excellent boat trains) to Continental ports. Some time ago there were rumours of a suggested seaplane service (which incidentally very much gave the impression of a camouflaged German one) between the northern countries, Germany and Great Britain. We understand that negotiations are still in progress, but surely British interests are not best served by sitting down waiting for some foreign firm to take the initiative. One might think that foreign seaplanes were so much better than British that something of this sort was inevitable, whereas in point of fact the reverse is the case. For sheer seaworthines British seaplanes need not fear comparison with any foreign products, even if some foreign machines, by using much heavier loadings, can show a slightly greater paying load per horse-power.

* * *

Another Link

By the time this week's issue of FLIGHT reaches our readers, or at any rate by the end of the week, it seems probable that, ruling out accidents, Mr. Alan J. Cobham and his companions will have returned to the Stag Lane aerodrome, after having covered something like 17,000 miles in their flight from London to Cape Town and back. Thus one more link will have been forged in the chain which will ultimately join up the hub of the British Empire to its most outlying points. The outward journey took some considerable time, owing to the necessity of carrying out observations of the route, and to other causes. The return journey has been made in excellent time, and would have been completed in even shorter time had it not been for very bad weather over portions of the route. We hope to return to the subject again next week. In the meantime we would express our admiration of the manner in which once more Cobham and Elliott have "carried the flag" on a difficult, and therefore all the more meritorious, flight.

Concerning the technical equipment, the aeroplane used, a de Havilland D.H. 50, is of a type that has already won fame for other long-distance flights such as, to mention but one, the flight from London to Rangoon and back last year, when the Director of Civil Aviation, Air Vice-Marshal Sir Sefton Brancker, was the distinguished passenger. For that flight it may be recalled, Mr. Cobham was awarded the Britannia Trophy for the most meritorious performance in 1925. On the London-Cape Town-London flight the power plant was an Armstrong-Siddeley "Jaguar," which thus has the distinction of being the first British air-cooled radial engine to complete a flight between points as far separated as are London and Cape Town. As far as can be gathered, the engine has run admirably throughout the flight, so that what with this and the long run without overhaul just completed by the Bristol "Jupiter" between London and Bristol, it may be claimed that British air-cooled engines have proved themselves without doubt among the finest in the whole world.

▣ ▣

Mr. Sigrist indisposed

IT is with regret that we learn that Mr. F. Sigrist, co-managing director with Mr. T. O. M. Sopwith of the H. G. Hawker Engineering Co., has been ordered by his doctor to take an enforced rest from his arduous work. Mr. Sigrist has gone to the south of France for a month or so, and we are sure our readers will join us in expressing the hope that his stay in milder latitudes will quickly benefit his health and allow him to return to "harness."

DURALUMIN CONSTRUCTION ON ORIGINAL LINES

Some Impressions of a Visit to the Works of Short Brothers

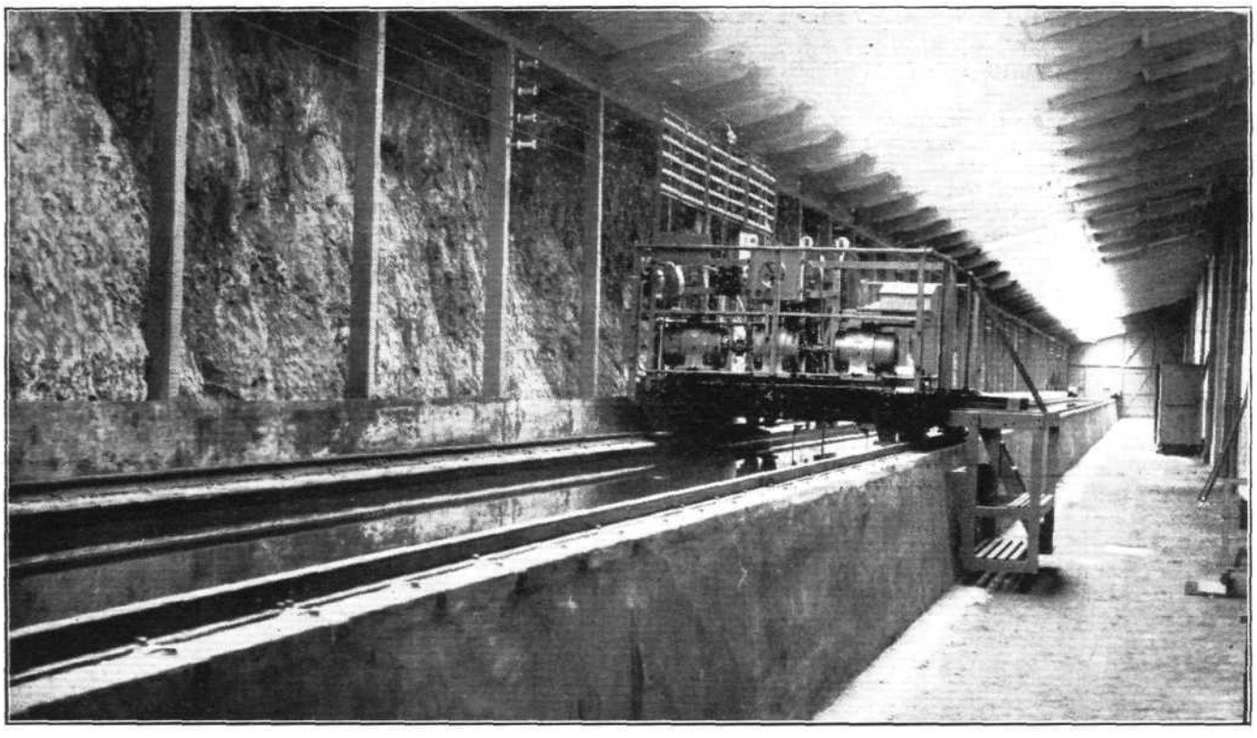
For very many years the development of aircraft construction in Duralumin was retarded, as far as Great Britain is concerned, by the official view that this material was not sufficiently reliable and consistent to make it advisable to employ it for parts that had to resist heavy stresses, in other words, for main-structure parts. Other nations, however, did not share that view, and in Germany several designers have employed the metal successfully for a number of years. Rather more recently, French designers have turned their attention to the use of Duralumin, and by now there are in France very many aircraft firms who use this metal extensively, and as far as can be gathered, the "snags" which were expected by people in this country have not materialised. It is true, that France has had a very real incentive to making an effort to develop Duralumin construction in the fact that aluminium is a plentiful home product in France, whereas steel of the qualities suitable for aircraft construction has to be imported. Apart from this fact, however, several French aircraft designers hold the view that judged on its qualities only, Duralumin offers advantages.

In Great Britain, as we have said, development was retarded because of a certain official distrust of the material, and it is not until comparatively recently that a start has been made with all-Duralumin aircraft construction. For the change in the official attitude towards Duralumin as an aircraft material, Short Brothers, of Rochester, one of the pioneer aircraft firms of Great Britain, can claim a good deal of credit. Immediately after the war, Mr. Oswald Short, favourably impressed by the possibilities of using Duralumin, and with very considerable experience in rigid airship construction to draw upon, decided to construct an aeroplane in which Duralumin was used extensively. This machine, the "Silver Streak," had an all-Duralumin fuselage, and wings having Duralumin ribs, while the covering was in the form of very thin Duralumin sheets. The wing spars, however, were in the form of steel tubes of circular section. The fuselage was remarkable on account of the form of construction, in which there were no longitudinals, or longerons, running right through. The fundamental principle consisted in the use of a series of hoops or formers of L and channel sections, to the flanges of which the Duralumin sheet covering was riveted. The covering was stiffened against compression loads by longitudinal V-section strips, interrupted at the formers. This machine was flown a great deal after the Olympia show, and its clean lines resulted in a very good performance for the power of the engine fitted. After various delays, orders were placed for a few machines of this type, and one was, we believe, tested to destruction at Farnborough.

The "Silver Streak" may be said to have marked the beginning of Duralumin construction at the Rochester works of Short Brothers, and although orders have been none too plentiful, the firm has managed to forge ahead and to develop the special form of construction of which the "Silver Streak" was the first example. Changes have been made since, notably in wing construction, the spars of which are no longer circular section steel tubes, but built-up Duralumin box spars, but as regards the fuselage construction, the original type has been essentially maintained.

AT THE ROCHESTER WORKS OF SHORT BROTHERS: A general view in the shop in which metal spars are made. Although capable of producing spars for very large machines, the equipment is by no means elaborate.

Comparatively recently the same principle, with minor modifications, dictated by local requirements, has been applied to the construction of flying-boat hulls, and one of these, built to take the standard superstructure of the F.5 flying boat, has now been in service for a considerable period, and has, we believe, given excellent results as regards durability and seaworthiness. A very great point in favour of metal hulls is, of course, the absence of water soakage which in large boats may amount to several hundred pounds. If a Duralumin hull is watertight, and so far the experience of Short Brothers has been that there is no difficulty in making such a hull watertight, the absence of soakage alone would appear to justify the use of such hulls. It seems, however, that with the forms of construction originated and developed by Short Brothers there is the further advantage that the Duralumin hull can be built with a very considerable gain in structure weight. If, as appears likely, protective coatings can be discovered which will prevent altogether the corrosion



AT THE ROCHESTER WORKS OF SHORT BROTHERS : The tank in which models of flying boat hulls and seaplane floats are tested. This equipment has been of inestimable value in producing hulls and floats having a good water performance.

troubles which formed the main drawback to the use of Duralumin in the earlier days, the Duralumin hull should also score on the point of durability, so that everything concidered, it will scarcely be denied that this form of construction holds out great promise, and it is to be hoped that the firm which may be said to have pioneered Duralumin construction in Great Britain, will in time reap a suitable reward for its foresight and perseverance in the face of many obstacles.

We recently had an opportunity of seeing at Rochester some of the work being carried out, and although official regulations prevent any reference to a large percentage of the work, it is hoped that the following impressions, incomplete and disjointed as they necessarily are, may serve to give at anyrate some idea of the extent to which this firm has advanced along entirely original lines.

A very large flying-boat was in course of construction. As this is being built for the Air Ministry it is not possible to refer to it, either by name or by description. It is a machine of rather unusual design, and the Duralumin hull is a very wonderful piece of work, the manner in which the Duralumin plating is attached in such difficult places as the reverse curvature occurring where the hull sides are swept into the chines being quite a feat in construction. Without knowing the actual dimensions of this hull, we should imagine that it is probably one of the largest boat hulls ever built entirely in metal, and it is worth noting that the weight promises to work out very considerably lighter than that of a wooden hull of the same size.

While on the subject of hulls, it may be mentioned that we had an opportunity of examining the Duralumin floats of the British Schneider Cup seaplanes, those of Hinkler's " Gloster " having been repaired by having new " noses " put on them where they were damaged by the propeller when the undercarriage struts collapsed. Under the terrific shock the front watertight bulkheads held, and the rest of the floats was not damaged. The facility with which the damaged floats were repaired is rather an eye-opener to those who have held the view that metal aircraft is difficult to repair. The internal construction of these floats is very simple, and we gather that the weight works out somewhat smaller than that of the best wooden floats of the same dimensions.

In many ways the most interesting shop which was inspected during our visit was that in which the metal spars are made. In an article by Mr. Oswald Short, published in THE AIRCRAFT ENGINEER on January 28, 1926, a photograph was given of a Short Duralumin spar under test. One of the accompanying photographs shows the spar shop, from which it will be seen that the plant employed at the Short works for the manufacture of Duralumin spars is by no means an elaborate one. In fact, it might almost be described as primitive but for the fact that the word rather suggests something of a makeshift nature, and might thus convey an entirely wrong impression. The present plant has not been arrived at without a great deal of experimental work being carried out, and the simplicity of the wing manufacturing equipment is rather like the apparently simple drawing of a clever artist, who has spent a great deal of time in learning " just now " to attain the appearance of simplicity. Without going into detail it may be mentioned that the present wing plant is not excessively costly, even for the production in small quantities, while capable, should the need arise, of producing wings in large quantities at quite a good rate and, of course, very much lessened cost. In this matter one received the impression that, whatever may be the relative merits of steel and Duralumin construction *per se*, the minimum plant necessary is a good deal lower in cost for Duralumin than for steel.

It goes without saying that the all-Duralumin construction is not carried out without its concomitant equipment for the heat treatment of the metal, and an inspection of the normalising baths proved most interesting. Here the metal, whether in sheet or in the form of rivets, is heated to a certain temperature, after which the material is put through its various processes of manufacture, such as pressed into the required shape for wing spars, etc., as regards the sheet, or, in the case of rivets, the riveting done within an hour after normalising.

Concurrently with actual construction, a considerable amount of research work is being carried out on the corrosion of aluminium alloys, on protective coatings, on watertight joints, on electrolytic action, and on many other problems which the use of metal for seaplanes brings with it. Incidentally we may mention that we inspected a Duralumin petrol tank in which riveting was employed for providing the necessary tightness, which in view of the difficulty of making a petrol-tight joint, impressed one as being something of an accomplishment.

On the design side we were privileged to inspect the large water tank, the equivalent of the Froude tank at Teddington, which Mr. Oswald Short had built some two years ago. The equipment of the tank is, although different from that at Teddington, highly effective, and the electric trolley can be run up to a speed of round about 12 knots for a sufficient period to get a reading of the various instruments used for measuring and recording the forces on the model under test.

A platform on the side of the trolley enables observers to watch the bow wave thrown up by the model, and its behaviour generally while travelling through the water. Already, we believe, the tank has been instrumental in getting rid of certain vices on the water to which boats and floats are prone, so that these were discovered and remedied before the full-size construction was commenced, thus avoiding a considerable waste of money and loss of time.

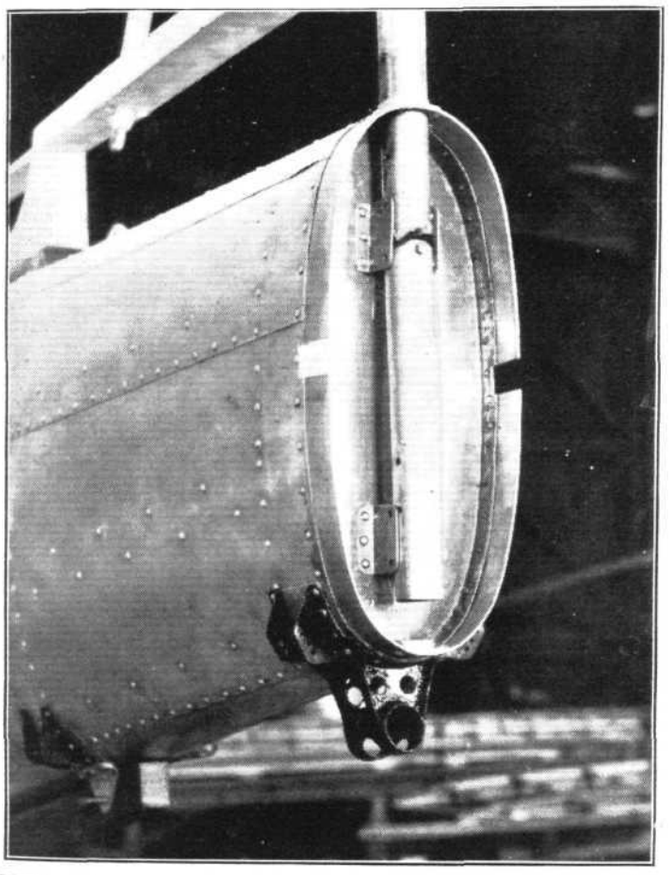
On the aerodynamic side a brief reference may be made to the pendulum testing apparatus, which at Short's takes the place of the more usual wind channel. This apparatus has previously been described in FLIGHT, and it may be recalled briefly that the apparatus consists of a long pendulum to which the model is attached, the pendulum being raised to a horizontal position and then released, the height to which it swings on the opposite side being a measure of the drag of the model.

There is a great deal about which columns could have been written, but unfortunately, from the point of view of a technical journal, so much of the work is of a secret and confidential nature that one may not even refer to some of the subjects. One came away from Rochester with the feeling that, although it is one of the oldest of British aircraft firms, Short Brothers are keeping well abreast of the times, and that they seem destined to become pioneers once more, this time in the all-Duralumin construction of aircraft.

THE SHORT S.7 "MUSSEL"

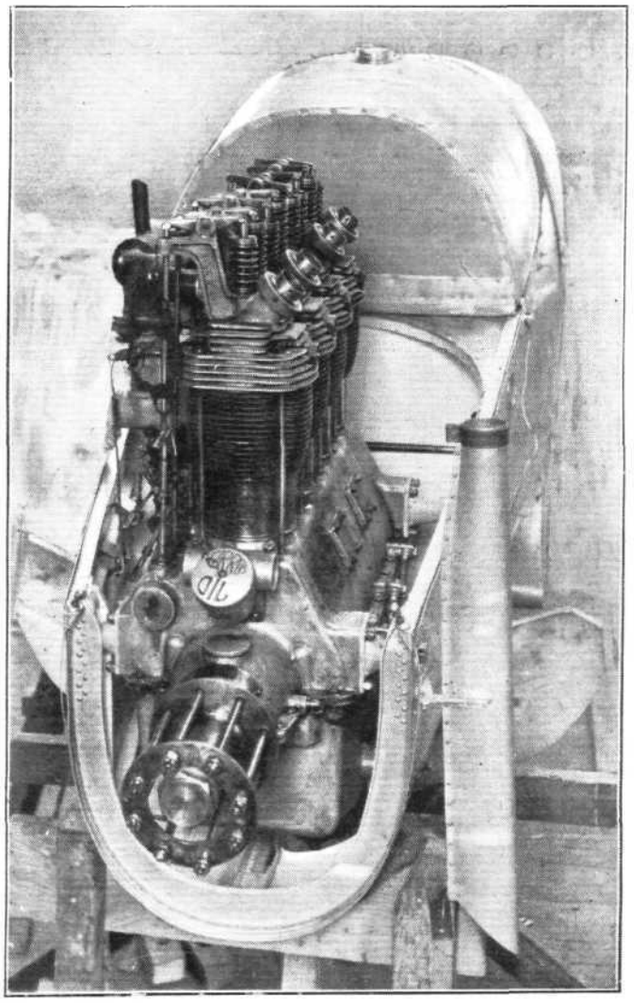
A Training Machine With 65-H.P. "Cirrus" Engine

IN many ways one of the most interesting low-power machines of recent years, the Short "Mussel," or S.7, to give it its official designation, has been expressly designed for use as a light training machine of robust and simple construction. In the general arrangement drawings published herewith the machine is shown as a seaplane, and this is to be the first form in which the "Mussel" will appear. Provision is, however, made for turning the "Mussel" into a landplane by substituting a wheel undercarriage and a tail skid for the twin-float undercarriage shown in the drawings. The engine fitted is an A.D.C. "Cirrus" four-cylinder air-cooled, developing a maximum of 65 b.h.p., similar to the engine fitted in the De Havilland "Moths" used by the British light 'plane clubs.



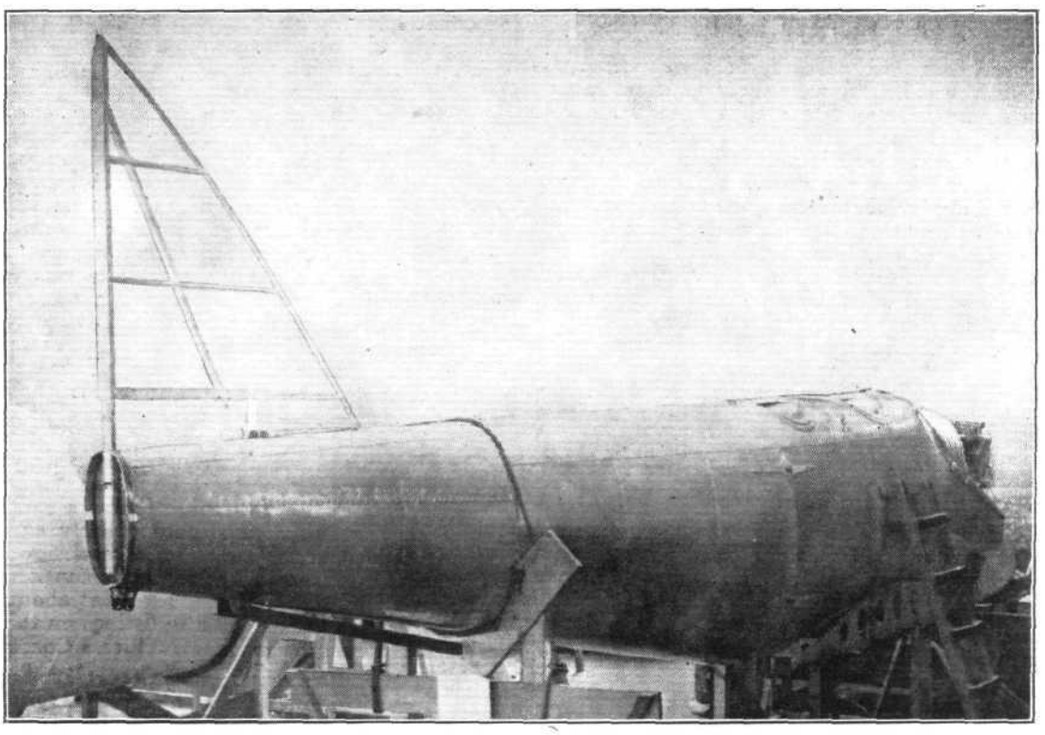
THE SHORT "MUSSEL": This photograph of the stern of the fuselage shows the neat attachment of the fin and stern post to a Duralumin plate forming the rear bulkhead of the fuselage. Note the steel fittings under and on the sides of the stern, which are for the tail skid and tail plane struts respectively. The skid is, of course, for use with the landplane only.

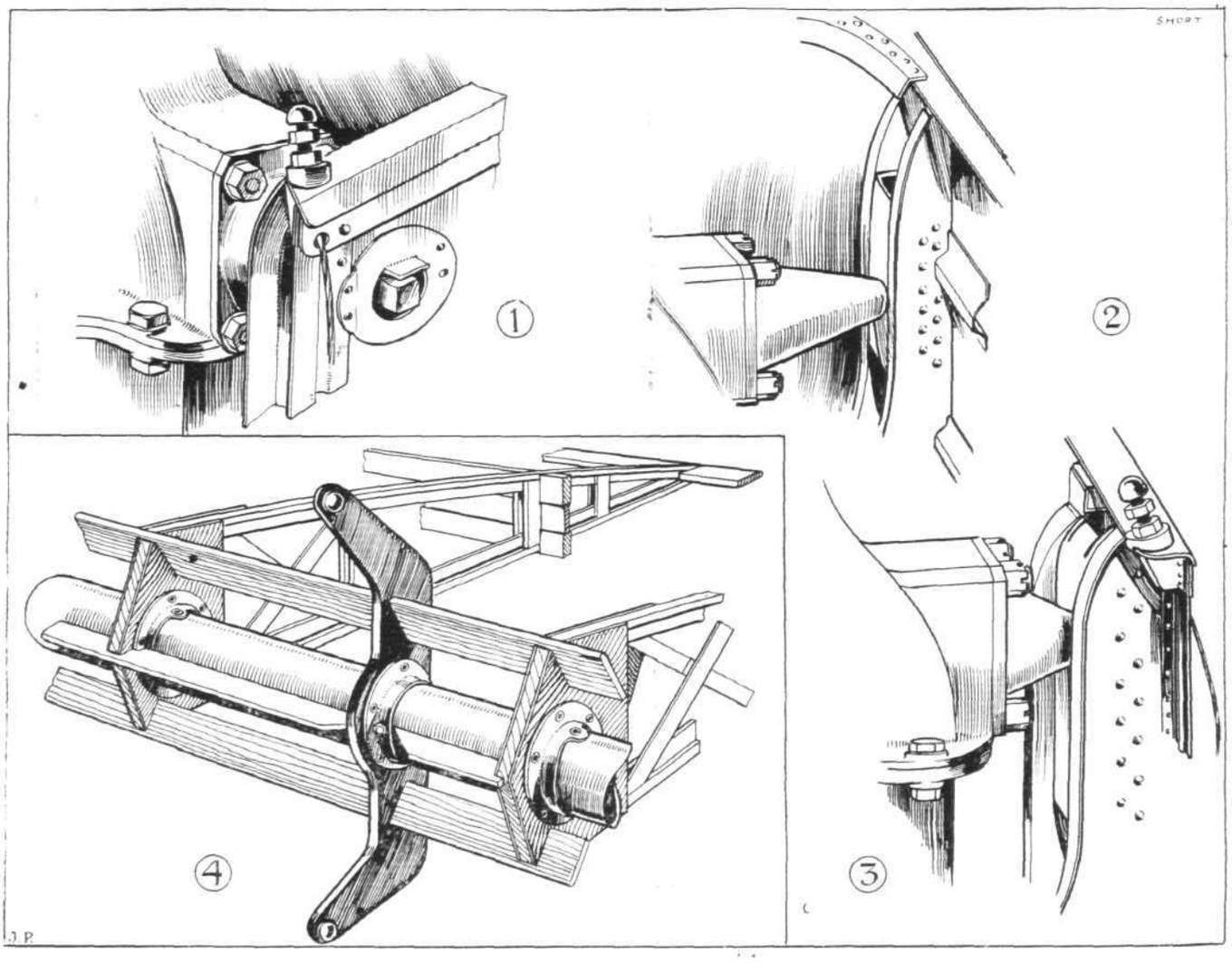
It may be recollected that at the last two Lympne meetings an all-metal light monoplane known as the Short "Satellite" took part. The Short "Mussel" may be said in a way to be a development of that machine, although differing from it in many respects, particularly in the general arrangement and in the details of the wing design and construction. Whereas the Short "Satellite" was a cantilever monoplane with the wing attached approximately half-way up the sides of the fuselage, the Short "Mussel" is a low-wing monoplane and the wings are of the semi-cantilever type, with compression struts running from a point about one-third of the wing out from the fuselage to fittings on the sides but towards the top of the fuselage structure. Constructionally the "Mussel" differs from the "Satellite" in that, whereas the latter had fabric-covered wooden wings, the "Mussel" has metal spars and wood ribs, the whole fabric covered. The fuselage construction is practically identical in the two machines and is of the type originated and developed by Short Brothers during the last six or seven years, in which a sheet Duralumin skin is employed as part of the stress-resisting structure, the sheets being riveted to hoops or formers of L-section and built-up channel-section construction. There are no longitudinal



THE SHORT "MUSSEL": The neat mounting of the "Cirrus" engine is well brought out in this photograph. The gravity petrol tank may be seen above and aft of the engine.

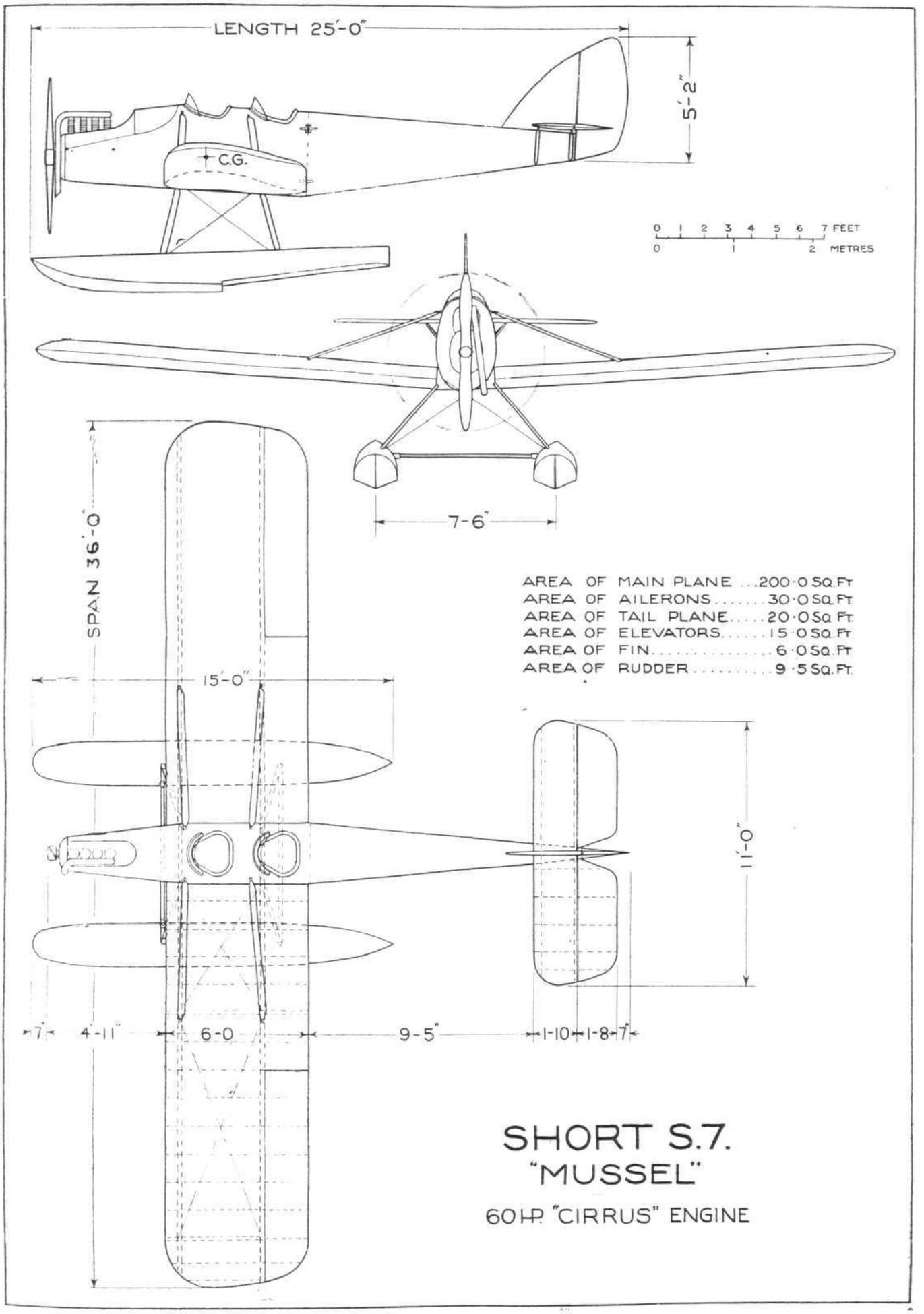
The Short "Mussel": A view of the fuselage, showing the skeleton of the vertical fin.





THE SHORT "MUSSEL": 1, 2 and 3 show details of the very neat engine mounting, the cone-shaped "feet" being bolted to the channel-section formers and secured by bolts projecting through the fuselage covering and readily accessible from outside. Taken in conjunction with the photograph showing the "Cirrus" engine, these sketches clearly explain the simple mounting. In 4 are shown details of the aileron construction, which incorporates wooden ribs attached to a Duralumin tubular spar by the small Duralumin sheet fittings shown.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

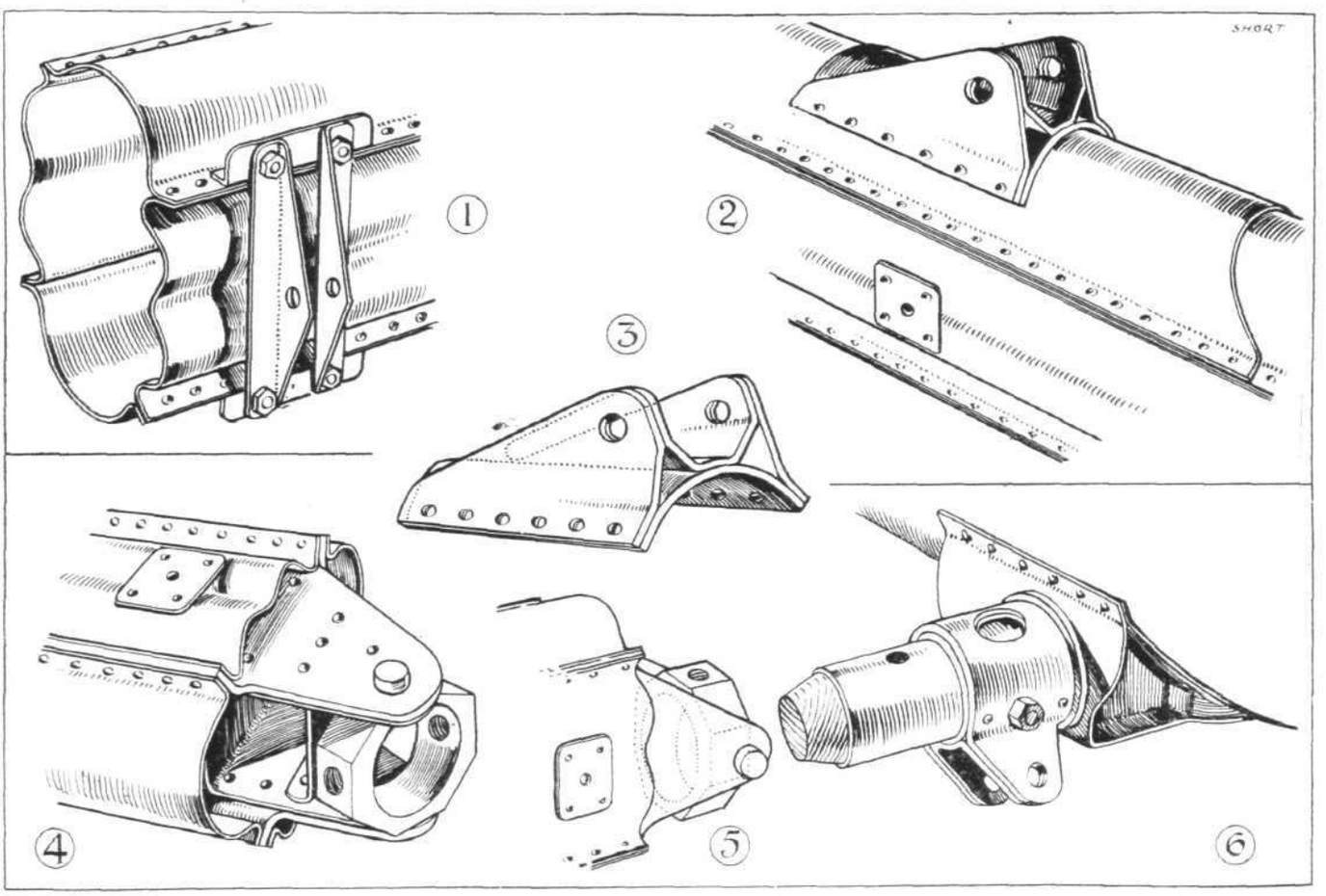


THE SHORT "MUSSEL," 65 H.P. "CIRRUS" ENGINE: General arrangement drawings, to scale.

members running right through the fuselage, the short V-section stringers being interrupted at the formers and riveted to the skin. These longitudinal members are placed at intervals around the circumference of the fuselage, and merely serve to stiffen the skin against compression loads. Tensile loads are, of course, taken by the skin itself, or, more correctly speaking, by the rivets attaching the separate small plates of the skin to the hoops and to one another. The resultant structure may be regarded as a tapering tube of oval cross-section, which should not only be very efficient aerodynamically, but should also be remarkably strong, particularly in torsion. There are several advantages, apart from the general advantages of metal construction, in the particular form of fuselage construction used by Short Brothers. From a manufacturing point of view, the fact that there are no stringers running through the whole fuselage means that parts of the fuselage could be manufactured and got ready for erecting in quite small shops. In the case of a small machine like the "Mussel" this is perhaps of minor importance, but when it comes to building hulls for very large flying-boats, in which a fundamentally similar construction is employed, this saving in space is by no means negligible, and the only shop which requires to be of large size is that in which the machine is erected. Another advantage would seem to be that in case of damage a fuselage of the Short type can probably be more easily repaired than one in which there are longitudinal members running through, since the damaged section can be removed and a new one put in its place without interfering with the rest of the fuselage.

In order to facilitate internal inspection and painting, as well as transport, the fuselage is built in two sections, the tail portion being detachable immediately aft of the rear cockpit. The two cockpits are arranged in the usual way one behind the other, each being provided with the usual stick and foot-bar controls. One of the sticks, however, is made instantly detachable, so that when the machine is not being used for training purposes the stick can be removed and placed in clips inside the fuselage out of the way of the passenger. In front of the cockpits is a fire-proof bulkhead separating the front cockpit from the engine, and the central portion of the fuselage is of particularly robust construction, since it is at this point that all heavy loads ars concentrated. Two of the fuselage hoops or formers are specially reinforced to receive the attachment for the two halves of the monoplane wing, and also, at the same points, the attachments for the undercarriage struts. One of these fittings is shown by a sketch.

The "Cirrus" engine is mounted in a particularly neat fashion in the nose of the fuselage. The standard "feet" of the engine have been removed, and another set of feet designed and made at the Short works. These also are illustrated by sketches, and it will be seen that they are of conical shape, with the apex of the cones resting against the bottom of the trough or channel-section formers, the square-headed bolts securing the feet of the formers projecting through the fuselage covering, so as to be readily accessible from outside. The mounting is one of the neatest we have yet seen, and is well illustrated by the sketches and by a photograph. The petrol tank is mounted aft of the engine and faired into the shape of the fuselage, at the same time being placed sufficiently high above the carburettor to give direct gravity feed. The tank has a capacity of 15 gallons, which is sufficient for an endurance of 4 hours at cruising speed.



THE SHORT "MUSSEL": Some constructional details. 1, shows a spar section, and also the attachmen of an aileron bracket. In 2 is seen an external view of a spar, with the built-up sheet steel fitting which takes one of the lift struts. The latter are placed above the wing, and are thus compression struts. The steel fitting is shown in more detail in 3. A spar root is illustrated in 4. Note the gimbal mounting. In 5 is shown the spar root, built into the lower part of the fuselage, which, in addition to receiving the wing, also supports the undercarriage strut.

The wing construction is of particular interest, since the main spars are of the latest Short type, being built up of laminations of Duralumin sheet, pressed out to corrugated sections. The construction of the spars may be gathered from an inspection of some of our sketches. By employing laminated flanges, all the strips can be pressed out in fairly light gauge material, and the necessary local strength obtained by gradually adding laminations to the top and bottom flanges, the laminations of course becoming shorter and shorter as the point of maximum stress is approached. With the form of wing construction employed this point naturally occurs at the point of attachment of the wing bracing struts,

and here, in fact, the spar flanges show several thicknesses of material. In order to avoid a too sudden change of section the ends of the laminations are sloped and bevelled so as to make the transition, for example, from four laminations to three laminations, a fairly gradual one.

The drag bracing consists of drag struts secured to the spar webs by bolts passing through both webs of the spars, and by the usual diagonal drag bracing. The fittings for the wing bracing struts are of particularly neat design, those for the front struts being built up from sheet steel into the form shown in a sketch. The curved portion of the fitting rests on the top flange of the spar, to which it is riveted, the whole making an exceptionally neat job. The rear spar fitting is somewhat similar, but is rather lighter. The inner ends of the wing spars are attached to the fuselage by a form of gimbal mounting, also illustrated in a sketch. Vertical bolts pass through the spar roots, and when once the wing bracing struts are adjusted for length no trueing up of the wings is required.

The wing ribs in the "Mussel" are of the lattice type, and in the first machine they are made of wood, although it is possible that in later machines Duralumin ribs will be used. The wing section employed is the new R.A.F. 32, which is a thick section with practically stationary centre of pressure. As far as we are aware this section has not hitherto been tested full scale, so that the Short "Mussel" provides an instance of using a low power machine for research purposes, apart from its direct usefulness as a machine. Should it be found that on the full scale R.A.F. 32 does not bear out the model tests, it will only be a matter of making a set of new ribs of different section, to be slipped over the existing spars.

The undercarriage of the "Mussel" seaplane is of the twin float type, and the floats are, like the fuselage, built up of Duralumin sheet riveted to L-section and channel section formers. Constructionally the floats are very similar to those used on the British Schneider Cup machines at Baltimore, which proved to stand up remarkably well to the hard pounding which they received. The floats are of the single step V bottom type, with domed tops. Bulkheads riveted to the formers and skin divide the floats into watertight compartments with suitable inspection covers, and the buoyancy of the floats is such that the displacement of each float is sufficient to support the machine. Watertight axles are built into the floats to take detachable wheels provided for beaching purposes. The undercarriage is completed by steel struts, pin-jointed to the fuselage and readily detachable and interchangeable with the land type chassis.

The land undercarriage is of simple design and is of the type employing rubber blocks working in compression, and giving long travel.

Considering the relatively low power of the engine, it is somewhat of an achievement to have produced a two-seater machine of the seaplane type in which the surplus of power required to get over the hump speed is necessarily rather greater than the power required for a land machine. Nevertheless, it is not expected that there will be any difficulty in getting the machine to unstick, especially as exhaustive tests on models of floats have been carried out in the large tank forming part of Short Brothers' equipment at Rochester.

The main dimensions, etc., are shown on the general arrangement drawings. Following are the main characteristics of the Short "Mussel": Weight of machine empty, 907 lbs.; weight fully loaded, 1,400 lbs.; available load, 493 lbs., made up as follows: crew, 320 lbs.; instruments, 18 lbs.; 15 gallons of petrol, 110 lbs.; 1¼ gallons of oil, 15 lbs.; luggage, 30 lbs. The wing area is 200 sq. ft., giving a wing loading of 7 lbs. per sq. ft. With a power loading of 23·3 lbs. per h.p., the following performance is estimated: maximum speed at sea level, 82 m.p.h.; cruising speed, 65 m.p.h.; landing speed, 44 m.p.h. Range at cruising speed, 260 miles, and endurance at cruising speed, 4 hours. The machine will be finished shortly when we hope to publish photographs.

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AIRCRAFT AND THE NAVY ESTIMATES

IN a statement on the Navy Estimates issued on February 27, by the First Lord of the Admiralty the following references to aircraft were made.

The number of Naval and Marine officers trained and employed as pilots now amounts to 70, and 42 are still under training. The first of the Naval officers attached to the Royal Air Force under the scheme approved by H.M. Government in 1923 have now completed their full training as pilots, and have been appointed for duty afloat. The appreciation of the Board of Admiralty has been expressed at the very satisfactory results obtained during their training. Arrangements have been made for all executive officers to undergo a short course in elementary naval aeronautics in an aircraft carrier, either during the last year of their service as midshipman or at the first opportunity subsequently as junior commissioned officer. Such arrangements will, it is hoped, increase the interest taken by junior officers in the work of the Fleet Air Arm, and will be of considerable value to them later, even should they not decide to specialise in air duties.

All the R.A.F. aircraft hands for general duties in the Fleet Air Arm have been replaced by R.N. ratings. These substitutions have resulted in economies in that they have enabled the total complements of aircraft carriers to be substantially reduced, since the naval ratings are available for and capable of undertaking ships' duties which the replaced airmen were not trained to perform.

Successful trials in launching aircraft from a catapult on the *Vindictive*, which has proceeded to the China station.

An appreciable economy has been effected by accepting, for the time being, a lower percentage of aircraft reserves.

Special courses in aerial navigation, meteorology and photography for selected R.N. observers have been instituted and a programme of practices in aerial fighting under sea conditions has been introduced for all Fleet Air Arm pilots and observers.

Steady progress in the use of aircraft by the Fleet is indicated by reports received from sea.

The subject of anti-aircraft gunnery continues to receive great attention. There is naturally a check in the acceleration of progress, while the material recognised as essential is being supplied, but the benefit of the investigations in this direction will be more fully reaped next year.

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SIR SAMUEL HOARE AT OXFORD

ON March 5 Sir Samuel Hoare, accompanied by Air Vice-Marshal Sir I. L. Vesey and Col. M. C. Drummond, inspected the hangars, equipment, and appliances of the University Air Squadron at Oxford. Just recently formed this squadron has a membership of 27 undergraduates, who receive instruction and carry out practical work at their headquarters in Manor Road, Holywell. Headquarters include an aeroplane hangar (together with a Bristol Fighter), and a workshop hangar containing various types of modern aero engines, instruments, etc. Instruction is given in aeroplane engines, the construction and rigging of aeroplanes, wireless telegraphy and telephony, air pilotage, aerial photography, armament, and aeroplane navigational instruments.

During term no flying is carried out, but a fortnight is set aside at the beginning of long vacation, when the squadron will operate as a unit at a service aerodrome.

In proposing the toast of success to the Oxford University Air Squadron at a luncheon held in Exeter College Hall, Sir Samuel said that while the idea of forming the two University (Oxford and Cambridge) Squadrons took shape a few months ago, he thought that he could claim that the Air Ministry had not wasted any time in providing the buildings and the necessary organisation for this very interesting experiment. They could never have formed the squadron in so satisfactory a way, much less so quickly, if it had not been for the great help that the University had given them.

The squadron had been formed for three reasons. First, they hoped it would make the connection closer between the Air Force and the University than it had ever been before, and as an outward sign of this close alliance that it would result in an increase in the number of University candidates for commissions. Secondly, it would give instruction to some of the many members of the University who were interested in the technical side of aeronautics, and thirdly it would provide some further opportunity for any who wished to do some original research work in the ever widening field of aviation. They must try to counteract the destructive power of the aeroplane in war by its development for the purposes of peace. It was on that account that he was anxious to make this flight with the new squadron in the humane atmosphere of Oxford, and to bring their work into touch with the life and thought of the University.

LIGHT 'PLANE CLUB DOINGS

London Aeroplane Club

FEBRUARY was a good month for flying. Flying instruction was given to the members on 23 days during the month; 177 flights were made, of which 126 were dual, 29 solo, and 22 test. All these flights were made on the one D.H. "Moth" G-EBLI.

For the week ending March 7, the total flying time was 20 hours 10 minutes.

The following members had flying instruction:—G. Quirk, T. W. Eady, A. R. Ogston, J. H. Saffery, E. A. Cook, W. Hay, P. G. Lucas, G. H. Craig, K. V. Wright, Major K. M. Beaumont, T. H. O. Richardson, O. J. Tapper, E. S. Brough, B. B. Tucker, R. C. Presland, Mrs. Eliott-Lynn, Sir John Rhodes, E. D. Moss, L. Anderson, R. Malcolm, J. C. Barros, G. N. Howe, R. P. Cooper, J. S. M. Michie, G. Vlasto, M. A. Douglas Hamilton.

The following members did solo flying:—N. H. Jones, Mrs. Eliott-Lynn, Major K. M. Beaumont, G. N. Warwick, Sqdn.-Leader M. E. A. Wright.

On March 1, N. H. Jones successfully passed the tests for his aviator's certificate.

On March 2, D. H. Kittell, who has recently acquired a D.H. "Moth" of his own, went up to carry out the tests for his certificate. During the height test the weather clouded over and he was obliged to make a landing in Essex. Having ascertained his direction, he flew back to the aerodrome later in the afternoon.

Mrs. Eliott-Lynn has recently gone through the technical examination for a "B" licence. The examination was conducted by Air Ministry officials, and Mrs. Eliott-Lynn has been notified by the Air Ministry that she has successfully passed in the subjects of navigation and meteorology, also in the examinations on flying machines, engines, and instruments in relation to the D.H. "Moth" type.

The following donations have been promised towards the third D.H. "Moth" machine which has been ordered for the London Aeroplane Club: Petroleum distributing companies, £200; E. J. Jones, £150; Lieut.-Colonel M. O. Darby, £50; Lieut.-Colonel J. Barrett-Lennard, £50; Sir John Rhodes, £25; Major K. M. Beaumont, £20; W. Hay, £20; Mrs. S. C. Eliott-Lynn, £10; E. S. Brough, £5; D. Kittell, £5; J. S. M. Michie, £3; Sqdn.-Leader M. E. A. Wright, £2; G. Quirk, £2; E. A. Cook, £2; G. H. Craig, £2; A. R. Ogston, £1; G. N. Warwick, £1; J. H. Saffery, £1; R. C. Presland, £1; T. H. O. Richardson, £1; T. W. Eady, £1; P. G. Lucas, £1; O. J. Tapper, £1; K. V. Wright, £1. Total to date, £855.

The Lancashire Aero Club

OWING to gales and high wind, flying has been possible on only Tuesday, Friday and Sunday, and even on those days for very short intervals. Mr. Stack gave instruction to H. Hardy, 1 hour; C. Agar, 1 hour 30 mins.; B. Smith, 1 hour 50 mins.; R. Wade, 50 mins.; D. Dyson, 10 mins.; C. Brown, 20 mins. Mr. Cantrill gave dual to S. Parker, 30 mins.; J. Leeming, 25 mins.; solo flights by A. Goodfellow, 30 mins.; M. Lacayo, 1 hour 15 mins.; J. Cantrill, 25 mins. Total dual, 6 hours 35 mins. Total solo, 2 hours 10 mins. Tests occupied 1 hour 10 mins. Total time flown, 9 hours 55 mins. Machines in use G-EBLV and G-EBMQ.

The third annual general meeting was held in Manchester on March 2, and the following elected to act as committee for the year: Messrs. A. Goodfellow, J. Cantrill, J. Scholes, R. Williams, H. Stern, J. Leeming, T. Prince, H. Grant, M. Lacayo, Mr. Wood remains as Secretary and Mr. Leeming as Chairman.

It was announced that owing to the generosity of Colonel Groves, work on the hangar was to be commenced at once. A proper hangar is the club's greatest need, and this assistance from Colonel Groves was most acceptable.

A special tribute was paid to the work done voluntarily by Messrs. Cantrill and Scholes as instructors. These gentlemen went to Upavon for the instructors' course, and have been at the aerodrome teaching pupils every week-end since September, busy men who have to travel from the other side of Manchester to Woodford, this must have been a great call on their spare time, and members realising this, expressed their appreciation most enthusiastically.

Tickets for the dinner-dance at the Midland Hotel on March 12 are now entirely sold out, and money is being returned to all members applying after March 6.

The Newcastle-upon-Tyne Aero Club

REPORT for week ending March 7:—Total flying time, 10 hours 35 mins., made up of dual instruction with Major Packman, 8 hours 15 mins.; solo ("A" pilots), 1 hour 15 mins.; passenger, 1 hour 5 mins.

It blew a gale throughout the week and from Monday to Thursday inclusive was added heavy snow storms, and during the first four days of the week only two hours' dual was possible, one hour each Monday and Thursday. Except for a short period early on Saturday and Sunday mornings, no solo flying was attempted. Only one machine is on service at present.

The following members flew under instruction:—Miss Leathart, Mrs. Marcks, Mr. Twine, Mr. Peacock, Mr. C. Thompson, Mr. Campbell, Mr. Bainbridge, Mr. W. Todd, Mr. Bruce.

Passengers, Mr. Davidson, Mr. Penrith, Mr. Grundy.

Solo, Mr. W. Baxter Ellis and Mr. R. N. Thompson.

On Friday, unfortunately a quiet day at the aerodrome at all times, Mr. Ellis took out the "Gull," but as the instruments are not yet fitted and on account of the strong wind, which, however, was not as bad as on the other days of the week, he confined himself to a couple of "straights." Mr. Heppell and Major Packman also had a straight each. It was impossible, owing to the strength of the wind to taxi back after a flight and the machine had to be wheeled back across the aerodrome on each occasion, reminiscent of flying about 1909. Altogether it is a very wonderful machine, and those who found much in it to cause amusement when it was first delivered, in a dismantled condition, are either openly converted or discreetly silent.

Report for the month of February: Unfavourable weather was again the rule during February, but it is highly satisfactory that Newcastle is once more able to claim the largest aggregate of hours flown among the clubs. Details are as follows:—

	Flights.	Hours.	Mins.
Dual instruction	91	50	43
Solo training	4	1	15
Pilot members' solo	23	13	27
Test and passenger	11	2	50
Totals	129	68	15

During nine of the flights by pilot members, totalling 4 hours 29 mins., members and visitors were carried as passengers.

Two members, Miss C. R. Leathart and Mr. T. R. MacMillan, were passed out for solo flying during the month.

At St. James's Palace

AT the Levee held by His Majesty the King at St. James's Palace on March 3, the following were amongst those presented to the King:—Flight-Lieut. C. T. Anderson, D.F.C., Flying-Officer G. C. A. Armstrong, Flight-Lieut. D. Carey, Squadron-Leader Wm. Coryton, M.V.O., D.F.C., Group-Capt. P. Fellowes, D.S.O., A.D.C., Squadron-Leader A. Glenny, M.C., D.F.C., Flight-Lieut. R. Houghton, A.F.C., Flight-Lieut. H. Junor, D.F.C., Flight-Lieut. G. Knocker, Air Vice-Marshal D. Munro, C.B., C.I.E., M.B., Wing-Commander G. Reid, D.S.O., M.C., Flight-Lieut. A. Rowan, Flying-Officer G. Smith, Wing-Commander W. Welsh, D.S.C., A.F.C., etc. Amongst those in attendance were: Air-Marshal Sir John Salmond (Principal Air Aide-de-Camp), Wing-Commander L. Greig, Wing-Commander J. C. Halahan, etc.

The Bristol "Jupiter" Endurance Test

THE endurance test of the Bristol "Jupiter" engine, which, fitted in a Bristol "Bloodhound" biplane, has been making trips almost every day between Filton (Bristol) and Croydon since January 4 last, has now been brought to a close, as the 25,000 miles' flight which was aimed at when the test opened has now been accomplished. In point of fact the period run was 225 hrs. 54 mins. and the distance covered was 25,078 miles. The final run was a non-stop flight from Bristol to London and return. The whole test has been completed without a single one of the seals affixed by the Air Ministry officials at the outset having been disturbed, which means that there has not been a single replacement or adjustment throughout the entire period. This is a record which, we believe, has never previously been approached by any aero engine of any type in any country. The petrol consumption, 21·9 gallons per hour, and the oil consumption, 3·95 pints per hour, are also remarkably low. The engine was running full well at the completion of the test, but the pilot, Col. Minchin, expressed keen disappointment at the discontinuance. It was felt, however, that the original idea should be adhered to, as there will be a good deal of practical interest in the inspection of the parts of the engine after stripping. When one bears in mind that the "Jupiter" engine is perhaps the lightest proved engine of its power in the world, weighing only about 1½ lbs. per horse-power, the merits of this performance can be better appreciated. The test has been officially controlled throughout by officials of the British Air Ministry and the whole of the piloting has been undertaken by two of the leading Imperial Airways pilots, Capt. Barnard and Col. Minchin.

The British Rigid Airships

LAST week we announced that work would soon commence on one of the 5,000,000 cub. ft. rigid airships—which we designated in error as the "Burney" airship, R.101. As a matter of fact, the Air Ministry vessel, which is being constructed at Cardington, Bedford, is known as R.101, while the airship, for which the Airship Guarantee Co.—or Commander Burney and Vickers, Ltd.—are responsible, is known as R.100, and it is to this vessel we referred.

The Royal Air Force Memorial Fund

THE fortnightly meeting of the Grants Sub-committee of the Fund was held at Iddesleigh House on March 4. Mr. W. S. Field was in the chair, and the other member of the Committee present was Squadron-Leader E. B. Beauman. The Committee considered in all 12 cases, and made grants to the amount of £72 3*s*. 3*d*. The next meeting was fixed for March 25 at 2.30 p.m.

French Trawler Rescues British Aviators

ONE of the Fairey IIID seaplanes of the Lee-on-Solent School of Naval Aviation recently crashed in the Irish Sea and the occupants, Flying-Officer L. G. A Kirschner and Lieuts. R. G. Baker and J. D. Harvey, R.N., were on the point of being drowned when their danger was observed by the French trawler *Louise Marguerite*, of Boulogne (Capt. M. Jean-Baptiste). Two of the crew set out in a small boat and with great difficulty succeeded in rescuing the three British officers, one of the French sailors, Eugene Deseigne, receiving injuries during the operation. The British destroyer *Champion* came up later and rendered medical attention, and afterwards the injured sailor was taken to hospital at Penzance. The bravery of the French sailors has been brought to the notice of the British Admiralty.

FLIGHT

THE AFRICAN FLIGHTS

MR. ALAN COBHAM (accompanied by Mr. Elliott and Mr. Emmott) has successfully completed the return flight across Africa, from south to north, and has, as originally intended, covered the 5,830 miles with true Cobham hustle. Thus, he flew from Cape Town to Cairo in nine-and-a-half days, and if it had not been for one or two irritating delays caused by tropical rainstorms and sandstorms, he would have done even better. Last week we left Mr. Cobham at work with his native "Palais de Dance" scheme for hardening the sodden aerodrome at N'Dola, which apparently succeeded, for on March 2 he managed to get away as far as Abercorn where the night was spent. On the following morning they proceeded to Tabora, flying over the world's highest waterfall at Kalambo *en route*. Mud again gave trouble at Tabora, but they managed eventually to get away after refuelling and reach Kisuma the same day.

On March 4 a 4½-hours' flight to Mongalla was accomplished, and after a short rest there, the day's 800 miles was completed at Malakal. During this stage Cobham stated that the heat was appalling, but that the D.H.50J and the Armstrong Siddeley "Jaguar" stood it well. The next day they hurried on to Khartoum, and troubles commenced again. Proceeding on March 6, during a lull in a violent sandstorm, they climbed, first to 5,000 ft. then to 11,000 ft., in order to clear the dust-laden air, but not with any great success. Visibility was practically nil, and only a ghost of the Nile—their only guide—was seen (occasionally). Thus, with a short stop at Atbara, and with a head wind against them, they accomplished a nightmare flight of nearly 800 miles and nine hours' flying to Assuan—once being completely lost over the desert.

Sunday was truly a day of rest, for with the wind behind them they covered the 480 miles to Cairo in 4 hrs. 40 mins. However, more sandstorms prevented them from proceeding to Sollum until March 9, and here we must leave them until "our next."

In the meanwhile the R.A.F. flight of Fairey III.D's (Napier "Lions"), under Wing-Commander C. Pulford, was making good progress in the opposite direction. On March 3 they arrived at Atbara from Assuan, stopping at Wady Halfa on the way. Khartoum was reached on March 4, and on March 6 they proceeded to Kosti, where they had to land owing to a sandstorm, which held them up until March 8, when they flew on to Malakal.

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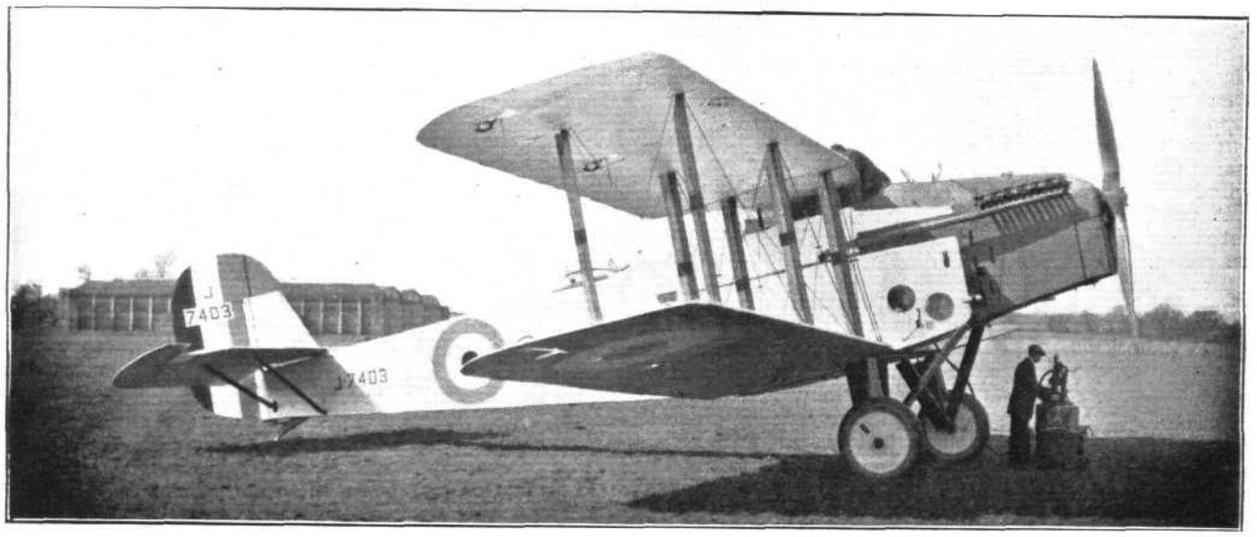
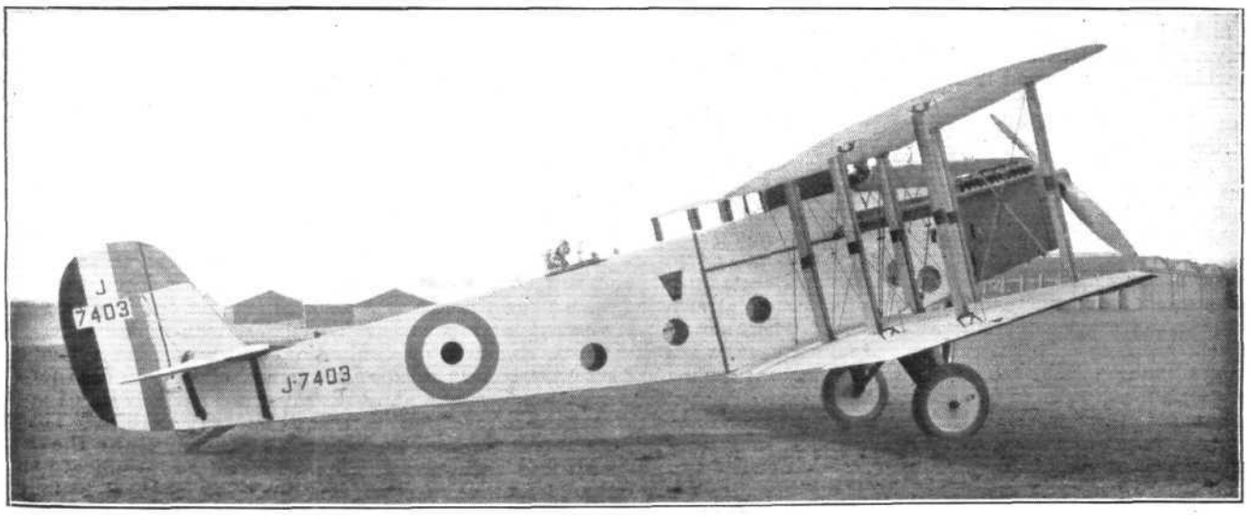
AN ARISTOCRAT





The Bristol "Berkeley" is a day bomber fitted with Rolls-Royce "Condor" Engine. The machine is of all-metal construction, with steel as the material used for the main structure members and Duralumin for minor parts. For the Bristol-Frise patented balanced ailerons it is claimed that they introduce no yaw to interfere with the sighting of the bomber. The pilot's cockpit is placed ahead of the wings, where his view is particularly good.

AMERICAN AERONAUTICS*

(*Concluded from page* 98)

OWING to lack of space it has not been found possible to publish until now the concluding instalment of our article on "American Aeronautics," which was commenced in our issue of February 18, 1926. The first article dealt with the general constitution and organisation of the American National Advisory Committee for Aeronautics, and a commencement was made by referring briefly to the work done during 1925 by and on behalf of the Sub-Committee on Aerodynamics at the Langley Memorial Aeronautical Laboratory, where most of the aerodynamic research work is carried out, at Stanford University, at the Washington Navy Yard, at the Bureau of Standards, at the Massachusetts Institute of Technology, and at McCook Field. The following notes deal briefly with the work of two other sub-committees, viz., that on power plants for aircraft, and that for aircraft materials.

The Committee on Power Plants for Aircraft, it might be mentioned, has direct control of the power-plant research conducted at Langley Field, and also of special investigations authorised by the Committee and conducted at the Bureau of Standards.

At the Langley Memorial Aeronautical Laboratory the study of the application of fuel injection to the two-cycle engine with spark ignition has been continued and brought to a conclusion. The induction system of the Liberty engine cylinder was further modified, which gave improved results. The study did not include design development necessary to promote satisfactory operation at low speeds and loads. It was found that 53 b.h.p. could be consistently developed with the modified Liberty cylinder at 1,300 r.p.m. (116 lb./sq. in. B.M.E.P.) using a scavenging air pressure of 5½ lbs. per square inch. Only 28 b.h.p. is obtained with the standard Liberty engine at the same speed.

The application of fuel injection to four-cycle aero engines operating with Diesel engine fuel oil and using the heat of compression for ignition, has been further studied. A special steel cylinder has been used to study combustion chamber forms. A pre-combustion or bulb type cylinder head has been tested at speeds up to 1,800 r.p.m., using an eccentric-operated pump, and an automatic diaphragm type injection valve. Brake mean effective pressures up to 88 lbs. per square inch and fuel economies comparable to those of present-day aircraft engines have been obtained with an injection advanced angle of approximately 27° before top dead centre. A limited number of tests have been made to determine the effect of variation of the injection rate on the power output and fuel economy. A second head of slightly concave cross-section and arranged for injection of fuel directly into the cylinder is being tested. A cam-operated fuel pump and a spring-loaded type of injection valve are being used in this work. As a result of the tests it is thought that the pre-combustion chamber type of cylinder head is the more promising of the two for application to aero engines. A good deal of research work has also been carried out at this laboratory on fuel injection pumps and valves, on characteristics of fuel sprays, and on fuel characteristics. Super-charging is a subject which has for a good many years received attention in America, and the following reference to tests from the report of the Power Plants Sub-Committee is of interest. Comparative climb performance tests with and without supercharging of a D.T.2 seaplane, carrying equivalent military loads up to 2,000 lbs., have been completed, the supercharger fitted being of the Roots type. The results have shown that a material improvement in the performance of this type of aeroplane could be obtained by supercharging, even when heavily loaded and operating to moderate altitudes. It was found that when maintaining practical sea-level pressure at the carburettor at all times when supercharging the absolute ceiling was increased 90 per cent. when operating without military load, and 50 per cent. when operating with load. The service ceiling was increased about 80 per cent. for all loads, while the average rate of climb to the service ceiling was the same. The climb when supercharging was inferior at low altitudes, owing to the use of large propellers.

What is claimed to be the first successful supercharging of an air-cooled engine at high altitude has been accomplished at the Langley Memorial Laboratory, using the Roots type supercharger. Further tests with the Lawrance (Wright) J-1 engine with Roots supercharger in a T.S. land 'plane have been completed. When using the same propeller and maintaining full supercharging to 16,000 ft., the original service ceiling of 16,100 ft. was increased 65 per cent. The absolute ceiling was increased 56 per cent., the time to 16,100 ft. was reduced 59 per cent., and the average rate of climb to the new service ceiling was 43 per cent. greater than to the original ceiling without supercharging. Additional information of the effect of supercharging on the cylinder head temperatures of each of the nine cylinders has been obtained, giving maximum recorded temperatures for the various cylinders ranging between 500° F. and 560° F. Close examination of the engine revealed no undue wear or other ill-effects as a result of supercharging.

Other experiments with a Roots type supercharger on an engine having somewhat different cylinder construction have also shown a considerable increase in performance, apparently obtained with no detriment to the engine and without encountering excessive cylinder head temperatures.

A study has been continued of the relative performance of the normal compression engine, the high compression engine, and the supercharged normal compression engine. The results have shown that the maximum power output of the high compression engine operating on domestic aviation petrol at sea-level is obtained by maintaining full throttle and retarding the ignition timing sufficiently to suppress detonation, although the fuel consumption with this method is high.

The results of these tests will be used in connection with a programme of flight tests which is being conducted to determine the relative performance of a service type seaplane of the load carrying type, equipped with a normal compression engine, a high compression engine, and a supercharged normal compression engine, all having the same displacement and being used both with direct and geared propeller drives.

At the Bureau of Standards engine tests under approximate altitude conditions have been carried out by reducing the pressure at the entrance to the carburettor and at the exhaust port, exactly as in an altitude laboratory test, but allowing the air surrounding the engine to remain at sea-level pressure. Similar tests were made under "true" altitude conditions, *i.e.*, with the air surrounding the engine reduced to a pressure corresponding to the altitude. It was concluded that provided certain precautions were taken, satisfactory results could ordinarily be expected with the approximate type of tests.

New Engine Types

Both the Bureau of Aeronautics of the Navy Department and the Engineering Division of the Army Air Service have continued their efforts towards an increase in the reliability of aircraft engines, and the two organisations have co-operated closely in this development. A striking piece of work on the part of the Air Service is the new air-cooled Liberty. The report states that this engine has demonstrated on test that the air-cooled in-line engine will be one of the important developments of the future. A description of this engine was published in FLIGHT of January 21, 1926.

In this report is found the interesting statement that the Wright model P-2, the 400-h.p. static radial air-cooled engine, which incorporates the fan type supercharger for rotary induction purposes, has passed its acceptance tests with very excellent performance. Twelve of these engines have been ordered for flight-testing purposes.

In view of the keen rivalry between air-cooled and water-cooled engines, the following paragraph from the report of the Power Plant Sub-Committee is of interest: "The rise of the air-cooled engine with important reduction in power plant weights, due to the elimination of the cooling system, has forced the water-cooled engine to new endeavours. Increased power has brought about a balance on the basis of specific power plant weights between the two engines. This will undoubtedly force the air-cooled engine into the higher speeds and reduction gearing. Since results indicate that a large percentage of power plant failures are due to faults in gasoline, oil and water lines, the air-cooled engine still has important advantages. This fact accounts for the energy which is now being put into development of the three air-cooled engines for the Navy." The reference in the last sentence is to three Wright engines, the J-4 A of 800 cub. in. capacity, which will be used as a training engine, the new R-1,200 cub. in. engine which will be used in the observation and fighter class, and the 1,600 cub. in. P-2 intended for

* Extracts from the Eleventh Annual Report of the American National Advisory Committee for Aeronautics.

installation in machines of the single-engined and twin-engined bomber class.

Materials

The Sub-Committee on Aircraft Materials is further sub-divided into three sub-committees, one dealing with metals, a second with woods and glues, and a third with coverings, dopes and protective coatings.

During 1925 the Sub-Committee on Metals recommended a programme of research for the study of intercrystalline embrittlement of Duralumin. The outline of this programme was as follows: (*a*) the study of acceleration of this type of corrosion for testing purposes; (*b*) the effect of permanent deformation on material hardened by spontaneous ageing; (*c*) the effect of deformation on fully hardened material hardened by accelerated ageing at a higher temperature; (*d*) the effect of protective coatings; (*e*) the effect of gas during casting; (*f*) the effect of heating and quenching mediums; (*g*) the effect of the composition of the Duralumin tested.

Intercrystalline attack and embrittlement in material received from two American companies was produced experimentally, both in aged material and in material cold-rolled after ageing. Material which had been greatly deformed by rolling after ageing and slightly deformed by stretching, is stated to be under test. Preliminary results indicate that stretching prior to test hastens the intercrystalline corrosive attack.

The Bureau of Standards has continued to examine specimens found in service. These all confirm the conclusion that material cold-worked after ageing and subjected to corrosion is especially susceptible to embrittlement, although if the conditions are severe material which has not been worked after ageing is also attacked. Material which had been attacked in service by calcium chloride, cleaned, and re-varnished, was recently examined to see whether the intercrystalline attack had progressed. No proof was found that the attack had progressed further since the previous examination. These results indicate that a coating which is actually impervious to such agents as water vapour and "salt air" prevents the corrosion. The material was in "notch brittle" condition after cleaning, and was still in that condition, although apparently no worse. The report states that the information now in the possession of the Committee does not justify a pessimistic outlook in respect to the use of Duralumin as a structural material for aircraft, unless in very thin sheets. It is believed that research on the embrittlement problem will ultimately show how to prepare, protect and use this material to ensure reliability in service.

Concerning airship structures, the report states that previous tests of girders for the "Shenandoah" showed that the strength of these girders was determined by the elastic properties of the channels and the type of restraint offered by the lattices. The principal elastic constants of the channel are their two flexural stiffnesses (moments of inertia Young's modulus) and their torsional stiffness (torsion constant shear modulus). The object of the modern investigation was to determine by tests the relative importance of these three constants in determining the strength of the girders. According to the report the measurements so far made are consistent with the assumption that with the present construction the coefficient of torsional stiffness of the channels is the controlling factor in determining the load which these girders will carry.

The report points out that the Forest Products Laboratory of the Department of Agriculture conducts practically all the investigations on the application of woods and glues to aircraft construction. A lengthy series of tests is reported by the Sub-Committee on Woods and Glues, to which we are unable to refer in detail, owing to lack of space. A brief list of the subjects dealt with may, however, serve to give an indication of the class of work that has been undertaken. A study of the effects of the attachment of metal parts and fittings to wood members was undertaken and the results of the tests have been presented in the form of charts which give the most efficient size of bolt for given conditions.

A series of tests has been made on box spars of various dimensions and on I-section spars having plywood webs. The results lead to the conclusion that in the design either of plywood box or I-section spars a web thickness 25 per cent. greater than that calculated to give equal likelihood of failure by shear or compression will give the best results.

A preliminary study was made on the use of screws for fastening three-ply wood to spruce and ash frame members. As a result of the tests a table of screw sizes for different thicknesses of three-ply wood has been prepared for general design use.

Concerning waterproof glues, the report states that no adequate study has been made of the durability of glued joints under long periods of time. Experience indicates that in many places where glued joints are used, any change in strength or water resistance is very slow. Tests will be carried on over a long period of time with different water-resisting glues to determine the conditions under which glues will retain their original properties.

An investigation has been carried out in an effort to produce a grade A plywood with casein glues. The report states that satisfactory results have been secured on a laboratory scale and that plans are now being developed for one or more demonstrations on a factory scale. It is believed that by proper control of the glue and the glueing conditions it will be practicable to produce a satisfactory product in quantity.

Investigations have also been carried out on air seasoning of aircraft woods, on the effect of fungus infection on the mechanical properties of wood, and on the cause and detection of brashness of wood.

The Sub-Committee on Coverings, Dopes and Protective Coatings reports that at the Bureau of Standards extensive investigations have been conducted in the developments of experimental gas-cell fabrics for rigid airships. It is believed that a certain type of fabric which has been developed will, when fully developed, be the most satisfactory substitute for the goldbeater's skin now used in rigid airships.

A coating for Duralumin produced by anodic deposit of the metal in a plating bath has been developed. The deposit is stated to be a luminum oxide, which is said to be a distinct protection. The process is understood to be patented. Usually the articles are lacquered after the plated coating is applied.

At the suggestion of the Bureau of Aeronautics, Duralumin sheets such as are used for seaplane floats, were alternately exposed to sea-water and to air under tropical conditions. A coating has been developed which, it is stated, will prevent the growth of barnacles and be durable in air. It is made from plastic resin, coal tar, and toxic poisons. At the Naval Aircraft Factory, the report states, excellent results have been obtained, by using an inexpensive bituminous paint for floats and hulls, and it is stated that if the surfaces are enclosed this paint probably gives the best protection against under-water corrosion. The disadvantage is that the coating is heavy. The paint can be greatly improved by the addition of 10 to 20 per cent. of asbestine, a crystalline pigment showing a rod-like structure under the microscope.

On the subject of coatings for magnesium to prevent corrosion, preliminary exposure tests of magnesium sheets have been made and it was found that uncoated magnesium sheets corroded slightly and the colour became dark if exposed so that moisture dried off, but that they became deeply pitted in six months if the surface did not dry off. Sheets coated with silicate of soda resisted corrosion better than uncoated sheets, although if the surface did not dry off they did corrode. Two coats of aluminium spar varnish appeared to give perfect protection. Six months' tests showed about equal corrosion in magnesium and in steel sheets.

Changes at Supermarine's

THE London office of the Supermarine Aviation Works, Ltd., has been removed to Bush House, Aldwich, London, W.C. 2. The telephone number is now Central 7262, and the telegraphic address is "Supermarine, Estrand, London." We are also informed that Mr. H. Leigh Mossley, formerly on the board of directors, and London representative, has no longer any connection with the Supermarine Aviation Works, Ltd.

A.F. Flying Accidents

THE Air Ministry regrets to announce that as a result of an accident at Calshot to a Fairey III.D., of the Royal Air Force Base, Calshot, on February 26, 1926, Flight-Lieut. Geoffrey William Hemming, the pilot of the aircraft, and Flying Officer Robert Collins were seriously injured. Flight-Lieut. Hemming died of his injuries shortly afterwards, and Flying Officer Collins died in hospital on February 28.

As a result of an accident at Karachi, India, to a Bristol Fighter of the Aircraft Depot, Karachi, on March 5, Flying Officer Camille Percy Maurice Benjamin Caillard, the pilot of the aircraft, was killed, and No. 111099 L.A.C. Andrew Barron, was seriously injured and died shortly afterwards.

IN PARLIAMENT

Qualified Pilots

Mr. A. Williams, on February 24, asked the number of qualified pilots in His Majesty's Air Force at the present time ?

Sir S. Hoare : The number of qualified pilots in the Regular Air Force is 2,306, of whom, however, 103 are, for medical or other reasons, no longer available for pilots' duties.

Brennan Helicopter

Mr. Rose asked the total amount expended upon the experiments in connection with the Brennan helicopter from the beginning until the abandonment of the design last year ; and whether the country is under any further obligation to the inventor ?

Sir S. Hoare : The total amount expended over the seven years during which the experiments have been proceeding at Farnborough is estimated at £55,000. As regards the second part of the question, Mr. Brennan's contract with the Air Ministry expires on March 31 next, and I am not aware that he has any contractual relations with other Departments of State.

Mr. Rose : Why has this design been persisted in and all this money wasted ?

Sir S. Hoare : The money has not been wasted. We learnt very valuable lessons from the experience gained.

Mr. Rose : Does the right hon. gentleman consider that seven or eight years' work and an expenditure of £55,000 on a thing that is smashed as soon as it was started is valuable ? To whom is it valuable ?

Sir S. Hoare : The hon. Member can draw his own conclusions. In my view it has been of value to the Air Ministry and the State generally.

Passenger Air Services

Sir F. Hall asked how many passengers were carried in 1925 by civil air services operating to and from this country ; and what proportion of these were carried by British-controlled services ?

Sir S. Hoare : The answer to the first part of the question is 20,721 ; to the second 51 per cent.

German Airships

Mr. Wells asked the Secretary of State for Air if he can state, with regard to Germany, the number of airships in use last year, the number of airship flights, and the number of passengers carried ?

Sir S. Hoare : There were no airships in use in Germany last year.

Air Staff and Administrative Staff

Sir F. Sykes asked the Secretary of State for Air the number of officers on the Air staff and on the administrative staff at the Air Ministry, respectively, who are staff college graduates ; and in respect of such officers the numbers in each class who have served on the headquarters staff of a Dominion Government defence force ?

Sir S. Hoare : The answer to the first part of the question is 19 officers of the Air staff and 11 officers of the administrative staff of the Air Ministry ; to the second part, that one officer of the Air staff and one of the administrative staff have served on the headquarters staff of a Dominion Government defence force. These numbers include officers who have graduated or completed a course at the Army, Navy and Air Force Staff Colleges.

Imperial Defence and Three Co-equal Services

Mr. Ramsay Macdonald, on February 25, asked the Prime Minister whether he can inform the House before to-day's Debate whether the Government have any intention of raising afresh, by inquiry or otherwise, the question of the independent status of the Air Force and Air Ministry ?

The Prime Minister : I think it essential to announce that, in accordance with the policy of successive Administrations, the Government have no intention of re-opening the question of a separate Air arm and Air Ministry. We intend to pursue the organisation of Imperial Defence on the existing basis of three co-equal Services. It is in the interests of the Fighting Services that controversy upon this subject should now cease. We are convinced that the way to secure the higher co-ordination in our Defence machinery, indispensable to full efficiency and, indeed, to economy, lies not in the abolition of any one of the three established arms of His Majesty's Forces, but in combined action between all three through the machinery of the Committee of Imperial Defence and the agency of the recently instituted Committee of Chiefs of Staff. We are sure that we can rely upon all concerned to devote themselves loyally and wholeheartedly to this end.

Lieut-Commander Kenworthy : Will the right hon. Gentleman inquire into the feasibility of a Ministry of Defence for the co-ordination of the three Services on better lines in view of the economies that would result ?

The Prime Minister : That raises an entirely different question.

Lieut.-Commander Kenworthy : Oh, no.

Mr. Basil Peto : Will the Prime Minister bear in mind that he recently asked Members of this House to make suggestions for economy, and therefore, on the ground of economy alone, is it not desirable that the question referred to in his answer should at least be debated, and that members should not be understood to be muzzled and not to raise questions of this sort because it has been announced that it is not the policy of His Majesty's Government ?

The Prime Minister : The thought of muzzling never entered my head. A statement on somewhat similar lines has been made by each successive Government. I think it is the appropriate time, when these Estimates come before the House, to make such a statement.

Personnel and Machines (Ratio).

Maj. Glyn asked the Secretary of State for Air how many men does it require to-day to keep one aeroplane in service on the same method of calculation by which it was recorded that the figures for 1918 were 81, and for 1924, 53 ?

Sir S. Hoare : On the assumption that the figures quoted and requested relate to the ratio between the personnel strength of the Royal Air Force and the number of machines on the first-line establishments of Service squadrons, the ratio at present may be stated as between 49 and 50 personnel of all ranks for each first-line aeroplane in Service squadrons.

Royal Aircraft Factory, Farnborough.

Mr. Kelly, on February 26, asked the number of employees engaged at the Royal Aircraft Factory at Farnborough in January, 1924, January, 1925, and January, 1926, respectively.

Sir S. Hoare : The figures are as follow for the experimental and research and industrial staff :—January 1, 1924, 979 ; 1925, 1,002 ; 1926, 1,064. The technical staff located at Farnborough for airworthiness investigations, etc., are not included in these figures ; nor are the drawing-office staffs, clerks, typists, etc., who perform common services for the whole staff. The increase is due to greater concentration on scientific research and additional requirements in connection with the expansion of the Royal Air Force for home defence.

Flight Programme in Africa

Sir H. Brittain, on March 3, asked the Secretary of State for Air what is the approximate time within which the flight now being carried out by the Royal Air Force in Africa is to be completed ; and what will be the mileage flown ?

Sir S. Hoare : As regards the first part of the question, it is expected that the programme of the flight, which includes visits of varying duration to Pretoria and other centres as well as to Cape Town, will be completed within three months. The answer to the last part of the question is approximately 10,000 miles.

Air Forces Comparative Strengths and Expenditure

Sir Charles Cayzer asked the Secretary of State for Air (1) the present strength in fully-trained air pilots and first-line aeroplanes of the following Powers :—France, Italy, and the United States ; whether he has any information showing the extent to which the above-mentioned Powers intend to increase these air forces in pilots and first-line machines in the near future ; and whether he has any information as to the cost of the proposed increases ;

(2) The amounts spent on their respective Air Forces for the financial year 1925-26, or during the last account period available, translated for purposes of comparison into pounds sterling at present rates of exchange, of the following Powers :—Great Britain, France, Italy, and the United States ; and whether he can state the number of first-line aeroplanes available in a sudden emergency at present maintained by the above-mentioned Powers ?

Sir S. Hoare : As regards the first-line aircraft of France and Italy, I would refer my hon. Friend to the reply to the hon. Member for Finsbury, on February 10 ; according to the latest information available the first-line strength of the United States is about 600 machines. Whilst these countries have not, so far as I am aware, recently published any exact statistics of their flying personnel, the report of the Morrow (American) Aircraft Board gives the number of Italian pilots as 921, whilst the corresponding French figure is shown as 3,184. The same report gives the number of United States pilots as 1,473. I understand that the French Naval Air Service is eventually to be increased to 50 squadrons, and the Italian Air Service to 182 squadrons, but I have no information as to the cost involved nor of any contemplated increases in the French Military Air Service or in the United States Air Services.

As regards the amounts spent in 1925-26, as stated in my reply to Mr. Groves on July 29 last, it is not possible to segregate the expenditure of France and the United States upon their air services from their general naval and military expenditure on a basis comparable with British air expenditure—and adequate information is not available in regard to the cost of the Italian air service. In this connection I may say that the Morrow Report above referred to expressly recognises the impossibility of comparing the so-called air expenditure of the various Powers.

As regards the air expenditure of Great Britain, I would refer my hon. Friend to Air Estimates. A deduction of approximately £1,250,000 should, however, be made from the figures there given in respect of civil aviation, meteorology, supplies to British and Indian Army personnel in the Middle East, and other services which cannot properly be included in the cost of the Royal Air Force.

Further, Air Estimates include, in addition to maintenance charges, a large element of capital expenditure in connection with the expansion of the Royal Air Force for Home Defence.

Civil Aviation Accidents

Brigadier-General Brooke asked the Secretary of State for Air the number of accidents during 1924 and 1925 in which civilians carried by civil air services operating to and from this country were involved, and the number of fatalities ?.

Sir S. Hoare : As regards British civil air lines, there were in 1924 one fatal accident involving eight deaths and three accidents without casualties ; there were no accidents in 1925. As regards accidents on foreign air lines in this country, there were two accidents without casualties in 1924, and one fatal accident involving one death and injuries to two passengers and two accidents without casualties in 1925.

Cost of R.A.F. Forces in Iraq

Mr. Short asked the total cost of the maintenance of the Air Force in Iraq during 1919, 1920, 1921, 1922, 1923, 1924, and 1925, respectively ?

Sir S. Hoare : The following table gives the information requested by the hon Member :—

	£
1919-1920 (approximate)	835,000
1920-1921 (approximate)	1,060,000
1921-1922	1,346,158
1922-1923	2,799,367
1923-1924	3,575,984
1924-1925	3,188,675
1925-1926 (estimate)	2,744,100

These figures include for part of 1922-1923, and for subsequent years provision for various ancillary services undertaken by the Royal Air Force on behalf of the British and Indian Army personnel in Iraq, the expense of which had previously been borne on Army Votes.

British Air Mails

Commander Bellairs, on March 8, asked the Secretary of State for Air the number of miles flown by British airplanes carrying mails last year compared to 2,501,555 miles flown by the American Post Office Air Mail Service in the fiscal year 1924-25 ?

Sir Samuel Hoare : There is no organisation parallel to the American Post Office Air Mail Service in this country, where commercial aviation is left to private enterprise ; the Cairo-Bagdad air mail service operated by the Royal Air Force is maintained primarily for military purposes. I am, therefore, unable to give any comparable figures.

A Correction

In the last issue of The Aircraft Engineer two typographical errors occurred. On page 110*a* the last words of the first paragraph should have been "gun fire" and *not* "gun power" as printed. On p. 110*c*, column 2, the last word of the first line should have been "mechanistic", and *not* "metaphysic."

FLIGHT
THE AIRCRAFT ENGINEER AND AIRSHIPS

THE ROYAL AIR FORCE

London Gazette, March 2, 1926

General Duties Branch

Flight-Lieut. C. G. Wigglesworth, A.F.C., is granted a perm. commn. in this rank; Jan. 1. The following airmen are granted perm. commns. as Pilot Officers on probation, with effect from and with seny. of March 1: 10577 Sgt. J. McGuinness, 90741 Sgt. G. E. Campbell, D.F.M., 220549 Sgt. A. H. Owen. The following Pilot Officers are promoted to rank of Flying Officer: A. W. Elias, J. E. W. Bowles, H. R. D. Waghorn, F. M. Denny; Jan. 31. R. F. Francis; Feb. 15. Wing-Comdr. T. G. Hetherington, C.B.E., is restored to full pay from half-pay; Feb. 17. Wing-Comdr. J. C. Halahan, C.B.E., A.F.C., is placed on retired list and granted permission to retain rank of Group Capt.; Feb. 28. Sqdn.-Ldr. R. A. de H. Haig, A.F.C., is placed on retired list at his own request; March 3. Flying Officer H. L. Christie is transferred to Reserve, Class A; March 1.

Stores Branch

Flying Officer R. D. Lambert is placed on retired list on account of ill-health; March 3.

Accountant Branch

Flying Officer F. C. Warner (Capt., R.A.R.O., Leicestershire Regt.) is dismissed the service by sentence of Field General Court-martial; Dec. 30, 1925.

Memorandum

Flight-Lieut. E. L. Johnston, A.F.C., is granted permission to retain rank of Squadron-Leader.

Reserve of Air Force Officers

E. C. Hoar is granted commn. in Class A, General Duties Branch, as Flying Officer on probation; March 2. The following Pilot Officers are promoted to rank of Flying Officer; C. H. E. Coles; Dec. 16, 1925. L. F. Cubitt; Dec. 23, 1925. W. R. W. Kelley; Dec. 27, 1925. A. A. C. N. Smith; Dec. 31, 1925. H. A. Record; Jan. 21. L. H. A. Fray; Jan. 24; R. D. Wayman; Jan. 26.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Group Captain W. F. MacNeece, C.B.E., D.S.O., D.F.C., to R.A.F. Depot, Supernumerary, whilst employed with League of Nations Disarmament Committee; 1.3.26.

Wing Commander I. G. V. Fowler, A.F.C., to Inland Area Aircraft Depot, Henlow, for Techn. duties; 8.3.26.

Flight Lieutenants: F. H. Laurence, M.C., to H.Q., India; 26.1.26. A. S. G. Lee, M.C., to H.Q., Iraq; 16.2.26. C. Turner, A.F.C., to H.Q., Egypt; 14.2.26

Flying Officers: P. D. Baker, to No. 2 Flying Training Sch., Digby; 23.3.26. F. R. D. Swain, to No. 2 Flying Training Sch., Digby; 1.3.26. A. W. Daly, to No. 11 Sqdn., Netheravon; 23.2.26. J. S. Phillips, to H.Q., Egypt; 15.2.26. J. T. Hall, to No. 9 Sqdn., Manston; 8.3.26.

Pilot Officers: J. McGuinness, to R.A.F. Depot, on appointment to a Permanent Commn. (on probation); 1.3.26. G. E. Campbell, D.F.M., to No. 39 Sqdn., Spittlegate, on appointment to a Permanent Commn. (on probation); 1.3.26. A. H. Owen, to No. 207 Sqdn., Eastchurch, on appointment to a Permanent Commn. (on probation); 1.3.26.

Stores Branch

Squadron Leader W. L. Shaw, M.B.E., to Air Ministry; 8.3.26.

Flight-Lieutenants: A. Jukes, M.B.E., to Air Ministry; 1.3.26. E. W. Crosbie, to No. 1 Group H.Q., Kidbrooke; 1.3.26. K. D. G. Collier, to R.A.F. Base, Gosport; 24.2.26. H. E. T. Crocker, to Armament and Gunnery Sch., Eastchurch; 25.2.26. H. J. Barnham, to Station H.Q., Spittlegate; 22.2.26.

Flight Lieutenants: J. C. Shakeshaft, to No. 10 Group, H.Q., Lee-on-Solent; 8.3.26. P. J. Murphy and P. F. Connaughton, to Supply Services (Central Supply Depot), Iraq; 6.2.26.

Flying Officers: E. V. Bashford, to No. 502 Ulster Sqdn., Aldergrove; 23.2.26. R. D. Lambert, to No. 43 Sqdn., Henlow; 9.2.26. E. V. E. Andrewartha, to C. & M. Party, Cattewater; 19.2.26.

Flying Officer J. McCarthy, to H.Q., Egypt; 10.2.26.

Flying Officers: E. S. Bullen, M.B.E., to R.A.F. Base, Calshot; 8.3.26. E. F. Elliott, to Supply Services (Base Supply Depot), Iraq; 6.2.26. G. W. Longstaff, to Supply Services (Central Supply Depot), Iraq; 6.2.26.

Medical Branch

Flight-Lieutenant (Hon. Sqdn.-Ldr.) F. W. Squair, M.B., T.D., to R.A.F. Depot; 8.3.26.

Flying Officers: E. J. Jenkins, to No. 7 Sqdn., Bircham Newton; 24.2.26. J. P. Hederman and E. J. Mockler, M.B., to Research Lab. and Med. Officers, School of Instruction, Hampstead, on appointment to Short Service Commns., for short course; 23.2.26. R. L. C. Fisher, M.B., to Inland Area Aircraft Depot, Henlow; 18.2.26.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—

Lieuts. (Flying Officers, R.A.F.).—T. H. Villiers, to *Enterprise*, addl., and for flying duties in No. 406 Flight (on commg.); and R. A. Aldridge, to *Furious*, and for flying duties in No. 404 Flight (on *Enterprise* comm.g.). R. C. Allen, to *Eagle*, and for 402 Flight; Feb. 20.

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

STALLED CONTROL

[2127] Mr. Courtney's article in the issue of February 25 on the subject of "Stalled Flight and Control" opens up a subject of great importance. Except for some minor points, I am in thorough agreement with Mr. Courtney's remarks, and it is difficult to see how anyone, who has had reasonable flying experience, can be otherwise.

To sum up briefly:—

(1) *All* aeroplanes are (or should be) capable of being easily "stalled" by the pilot.

(2) If controls are infinitely improved the machine will still stall and may be brought down on a more even keel, but the impact will still be a very serious matter.

By all means let us improve control as much as possible, but does it take us much further towards safety in or after a stall?

It only brings us nearer safety if the method of training the pupil is based on correct principles.

I fully endorse Mr. Courtney's remark in which he says: "Make the stall crash subject a definite and important part of flying instruction." This is what I have been advocating for some years, because I believe it would have the effect of largely reducing the number of serious crashes.

As regards military training of pilots, there may be some sound reason why the present method is used, but of this I have no knowledge.

If we agree that prevention is better than cure, then in teaching the ordinary man to fly the correct method would seem to be:—

(1) To instil into the pupil by every possible means the importance of loss of speed.

(2) To make full use of the air speed indicator in training, from the very beginning.

At present we have an interesting paradox: on the one hand people are striving after "*control beyond stalling*" (chiefly aileron), and on the other hand, the orthodox method of training tells a pupil to assume the near approach of stalling "*by the loss of aileron control.*"

There are many machines existing today that have some degree of lateral control when on the point of stalling, so that when a pupil changes to a new type of machine it is only good luck if he does not stall. He has been taught to judge stalling by the feel of the lateral control, which feel only applies to the particular machine he has learnt on, and, in any case, only gives him warning when it is probably too late. He must not look at the air speed indicator, which does give him the information he requires, but why not?

There is, undoubtedly, prejudice among some pilots against the use of the air speed indicator, but I have never heard any sound argument in support of this attitude.

It is difficult to get away from a firmly-rooted idea, although it may be a fundamentally wrong idea, and I believe this applies to the use of the air speed indicator in training and general flying.

The method of instruction at some civilian schools is moving in the direction of the principles advocated. The London Aeroplane Club is an example, and it is to be congratulated on complete freedom from "stall" crashes and, in fact, from any serious accident.

Mr. Courtney has done well to open this subject, and I hope there will be further contributions to the columns of THE AIRCRAFT ENGINEER.

Stag Lane Aerodrome. G. DE HAVILLAND
March 5, 1926.

[2128] I have read Mr. Reynolds's reply to my article on "Stalled Control," which letter, I might point out to start with, comes from the Slotted Wing Factory. The last three words of his letter are in Latin, but the rest is Greek.

I certainly flew the slotted-aileron Avro for long enough

to satisfy myself that the control did not work as intended. This, however, has nothing to do with my main contention that it would be of no use if it did.

For the rest, Mr. Reynolds begs the whole question and loses the whole point.

He mistakes my appreciation of the ordinary large rudder as a demand for an *enormous* rudder.

He says that the reduction in drag on the down aileron makes that aileron go forward, without appearing to realise that a reduction in a positive does not necessarily make a negative, and certainly not in this case.

Where on earth he gets his idea that a stalled machine can keep on an even keel and pancake at a mere 16 to 20 ft. per second I do not know. If he can design such a machine it would be a godsend. So why doesn't he? This remark alone is sufficient to suggest that he has no appreciation of the subject under discussion.

His remarks on loss of height appear mysteriously to apply to anything except his own device.

There is nothing in Mr. Reynolds's letter to alter my opinion from what I originally said—namely, that the slotted aileron control does not do what it professes to do, and that if it did it would be of no use. Capt. Thomson's letter, while apparently only distantly referring to the subject, really touches the basis of the whole matter, in that he infers that the subject of the stalled crash is a vastly deeper matter than the mere fiddling with a stalling lateral control.

I would point out to Mr. Reynolds that this is almost entirely a flying matter. Before Mr. Reynolds gibes further at the "technique" of flying he should, perhaps, learn that the "joy-stick" can be used just as scientifically and just as unscientifically as the "guessing-stick."

In the meantime, we ignorant pilots await with interest Mr. Reynolds's machine which will pancake on a level keel at 16 to 20 ft. per second.

FRANK T. COURTNEY.

Wallington, Surrey.
March 5, 1926.

Aircraft-Carrier Armament

IT was announced in the *Times* of March 6 that H.M.S. *Hermes*, Capt. C. P. Talbot, D.S.O., is due to arrive at Malta from the China station on March 13, to resume duties with the Mediterranean Fleet. As the First Lord stated in his Memorandum, the situation in Canton last July rendered it necessary to dispatch this vessel there from Malta as an additional protection for British lives and property. According to the new Return of Fleets, the anti-aircraft armament of the *Hermes* has been reduced from four to three 4-in. guns. The *Argus* has four such weapons, the *Eagle* five, and the *Furious* six. Of the aircraft carriers building, the French *Bearn* will have an anti-aircraft armament of six 3·9-in. guns, the Japanese *Akagi* of 12 4·7-in., and the American *Lexington* and *Saratoga* of 12 5-in. There is, therefore, considerable variation in current practice in this important feature of design.

Squad.-Ldr. Haig's Appointment

THE well-known firm of William Beardmore and Co., Ltd. have appointed Squad.-Ldr. de Haga Haig as "outside" manager in connection with their aviation and aero engine departments. This post, which is an indication of the firm's growing aeronautical activities, is similar to that of the outside manager for shipyard and engineering departments; *i.e.*, Squad.-Ldr. Haig will be responsible for tests, equipment and delivery of aircraft and aero engines, and will act as liaison official between the company and its clients in connection with the completion and delivery of each contract. Important work is now going through the shops both in the aero engine and aircraft departments. The latter, at Dalmuir, are engaged upon Beardmore-Rohrbach all-metal flying boats for the Air Ministry.

Air Traffic to Kamtschatka

THE systematic way in which the Russian Government is organising air traffic in Siberia and the Far East is again shown by the recent contracts, which have been made between Dobroljot and Gostorg (the State Trading Company), in accordance with which air traffic is to be opened between Krasnojarsk-Turuchansk and Budinka. The route is to be flown with Russian-built Junkers type all-metal aircraft and will serve mainly for the transport of furs. The arrangement is due to come into force by May, 1926. It is added that these air routes are of an experimental and preparatory nature with a view to organising a regular air transport to Kamtschatka.

IRISH AIRCRAFT FAIL TO LOCATE MISSING SEAMEN

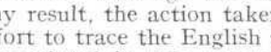
RECENTLY we made brief reference to the employment of Irish Free State aircraft in searching for the missing crew of the ill-fated trawler, ss. *Cardigan Castle*, which was wrecked off the west coast of Ireland. We are now able to give some further information which may be of interest.

The aeroplanes—without, unfortunately, any successful result—used by the scouting party were three of the latest design of Bristol Fighters and one De Havilland. The machines left Baldonnel aerodrome for the west on February 20, and a safe landing was effected a few miles outside Clifden, Co. Galway, and close to the spot where Alcock and Brown alighted on completing their flight from Newfoundland.

Capt. Crossley piloted the D.H.9 round Clifden Bay and High Island, and ascertained that there were quite a number of places on the lee shore where a boat could land. They circled down on the island—which is a kind of Atlantic breakwater practically wholly composed of high cliff rock—as close as Capt. Crossley and his observer dared, but they saw no sign of life on the island. It was on a similar island that the crew of the *Tenby Castle*, which was also dashed against the rocks and wrecked, were found previously. The weather was very misty and visibility bad, but the aviators, when night was falling, dropped a quantity of food and some first-aid dressings on the island, thus ensuring that if any survivors of the wreck should happen to be on the island they would have sufficient food at least to last them for a week.

The machines engaged in the work of rescue visited in all a score of islands, but without result. High Island is the island from which the message, written on a piece of board, from four of the survivors was supposed to have been sent out.

The search by aeroplanes was instructed by President Cosgrave. When volunteer pilots and observers were called for this hazardous job, every officer present eagerly stepped forward. Although this aerial search failed to bring forth any result, the action taken by the Irish Free State in their effort to trace the English seamen is nevertheless thoroughly appreciated in this country.



PUBLICATIONS RECEIVED

Aeronautical Committee Research, Reports and Memoranda: No. 983 (*Ae.* 195).—A Comparison of Model and Full-Scale Performance of the Bristol Fighter, using Flight-Lieut. Capon's Method of Presentation. By E. F. Relf. September, 1925. H.M. Stationery Office, Kingsway, London, W.C. 2. Price 4*d.* net.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1924

Published March 11, 1926

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